WIRED

THE MUTANT FUTURE OF FOOD

Looks great, tastes fine—and might just save the planet.

BY STEPHEN S. HALL

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An Epic Treasure Hunt Turns Deadly

P. 82

Do the Politics of Silicon Valley Make Any Sense?

P. 64

AI Bug Collectors

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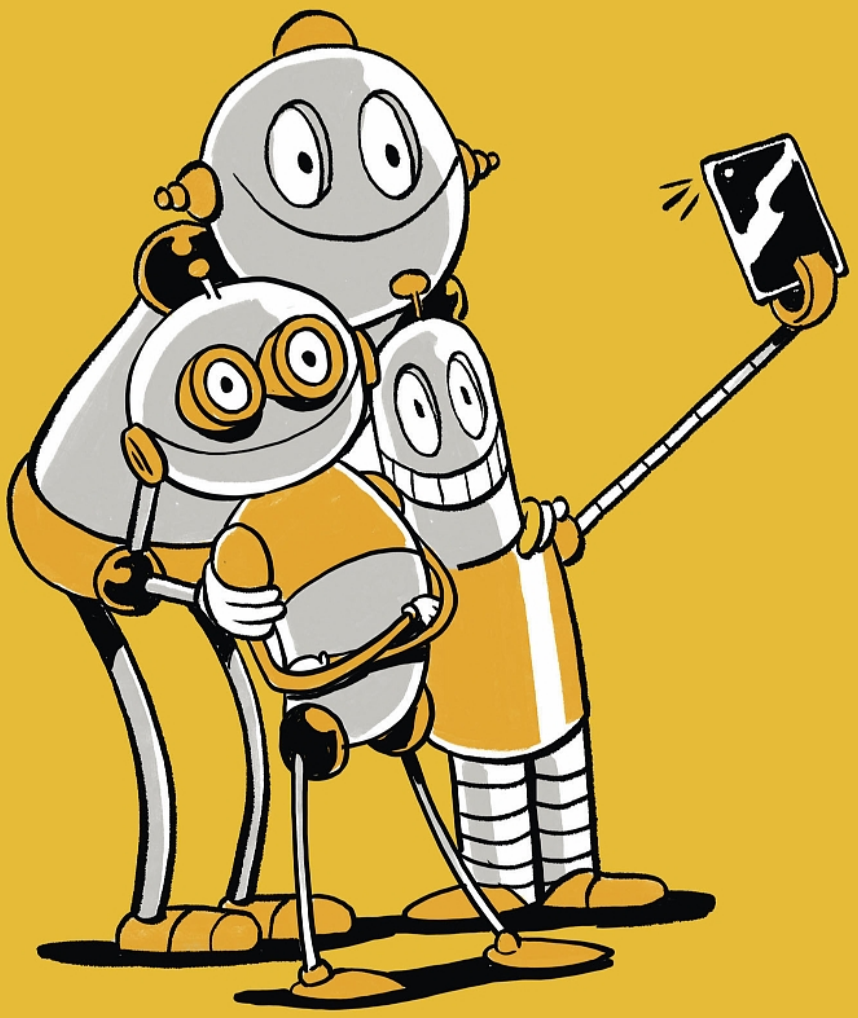

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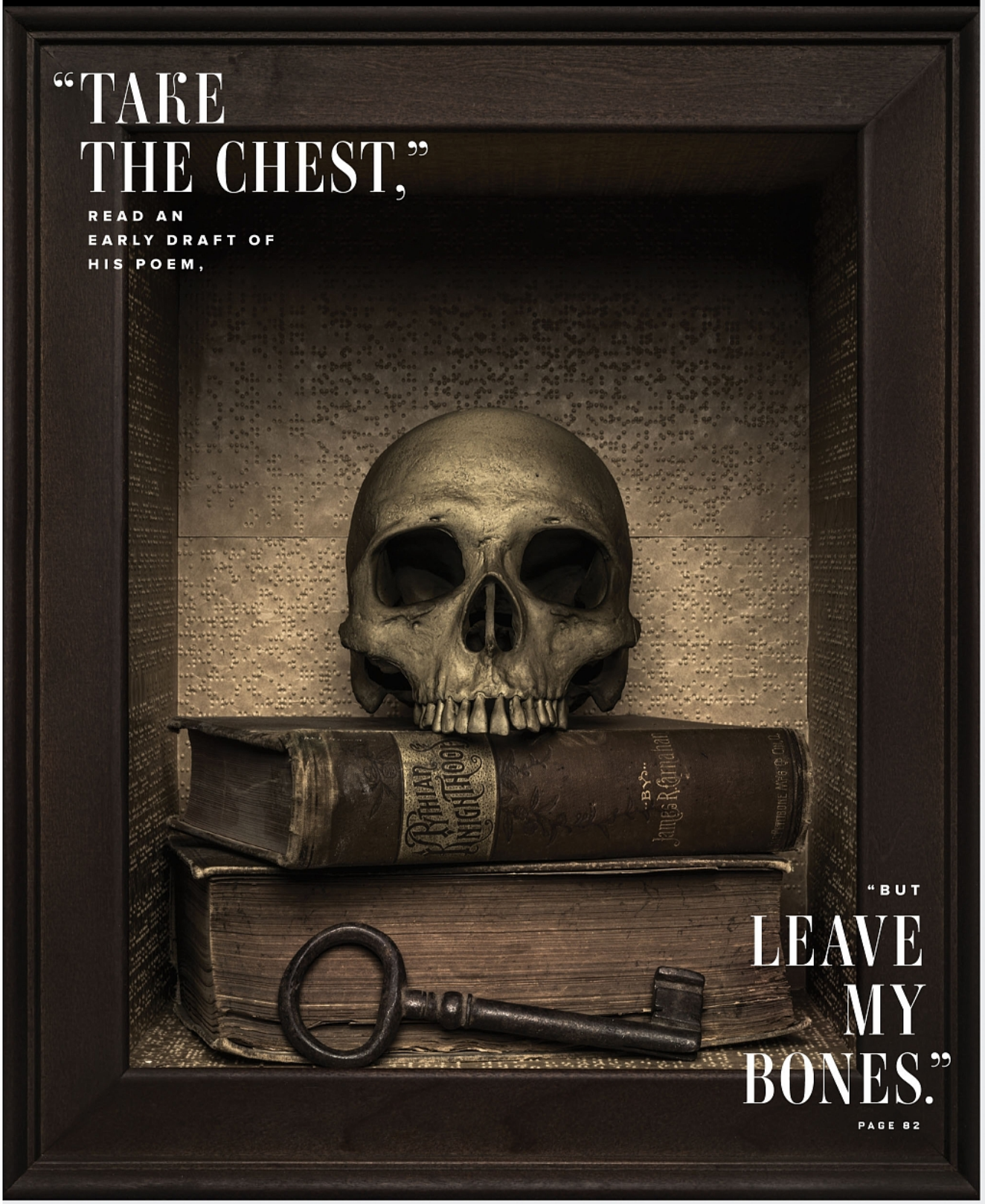
"TAKE THE CHEST,"

READ AN EARLY DRAFT OF HIS POEM,



"BUT LEAVE MY BONES."

PAGE 82

NEW BELGIUM
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Tomato, Tomorrow

With Crispr, scientists can now speed up nature—and change how we grow food.

BY STEPHEN S. HALL

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The Political Education of Silicon Valley

How did we get from John Perry Barlow to Ro Khanna?

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A Network of One's Own

Everyone thought Oprah had failed. Then her channel found its voice.

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For All to Seek

An antique treasure. A cryptic poem. And a deadly treasure hunt.

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26.08

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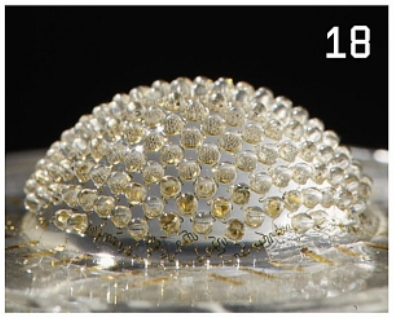
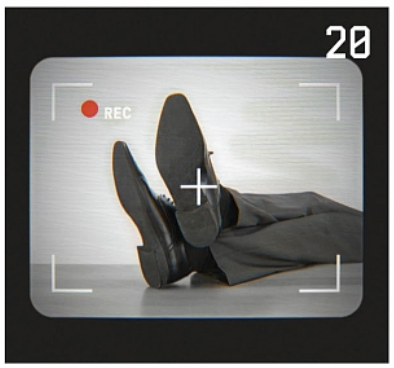


Buzz Buzz
The bug phone is calling



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ON THE COVER
Photographed for WIRED by Maurizio Di Iorio.*

*NO TOMATO WAS CRISPR'D FOR THE MAKING OF OUR COVER.

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Forrest Fenn, photographer Daymon Gardner, and Fenn's dog, Willie.

ON THE ROAD AGAIN

TO DOCUMENT THE irrational and at times deadly journeys people have taken in search of millionaire Forrest Fenn's hidden treasure ("For All to Seek," page 82), photographer Daymon Gardner, who is based in New Orleans, had to embark on an epic trek of his own: five days, three states, five flights, and 1,400 miles of driving. Does he think the prize, said to be a chest full of diamonds, rubies, emeralds, and gold, really exists? "Before I met anybody involved, I definitely questioned that. I want to believe in people. If this is a hoax then he's a monster," Gardner says. "I don't want to believe it's a hoax. I got the sense that the treasure really is out there."

Each summer, **Stephen S. Hall** grows tomatoes in his Brooklyn backyard, including heirlooms, despite their vulnerability to disease. So Hall was intrigued when scientists began tweaking his beloved crop with the gene-editing tool Crispr ("Tomato, Tomorrow," page 52). Most genetically modified foods to date don't "have much emotional resonance," says Hall, who teaches science journalism at NYU. "But tomatoes do. They're the gem of every home garden." (Nota bene: Owing to supply issues, no tomatoes were Crispr'd in the making of this month's issue.)

For years the Oprah Winfrey Network was primarily the province of self-help and talk shows with middling ratings. So last year, when the network announced deals with *Selma* director Ava DuVernay and *Moonlight* cowriter Tarell Alvin McCraney, WIRED senior writer **Jason Parham** took note. "They were bringing in a new class of creators. I knew there was something there." On page 74, Parham writes about OWN's move into prestige television. The network had found a reliable audience in black women, Parham says, but the stories they were telling were universal. "What I learned in the reporting is that, slowly but surely, they were creating revolution on TV."

Cathy Alter often has to navigate the reticence of not only her sources but also her friends. "When I go to dinner with friends, they'll say, 'This is off the record.'" But when the Washington, DC, journalist and essayist told her 6-year-old son, Leo, that he would be appearing in a magazine, his reaction was refreshing. She explained that his relatives will be able to buy the magazine at a store, and he was amazed. "He went, 'Whaaaat. Yes!'" Leo's enthusiasm for having his name in print mirrors his appetite for electric fans, a not-so-singular obsession that Alter explores on page 44. "When people hear about Leo's love of machines they say, 'He's going to be an engineer.' I say, 'Who knows?'"

MICAELA HALL (HALL); ABBY GREENAWALT (ALTER); MAI SCHOTZ (PARHAM)

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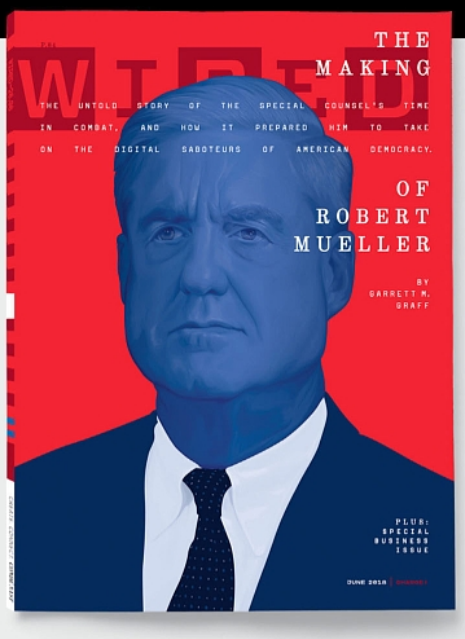


LEADER BOARD

IN OUR JUNE ISSUE, contributing editor Garrett M. Graff reported on special counsel Robert Mueller's time as a lieutenant in the Vietnam War and how it made him the man he is now. Andrew Rice profiled Federal Communications Commission chair Ajit Pai, whose repeal of Obama-era net neutrality rules has inspired volumes of internet vitriol. And editor in chief Nicholas Thompson sat down with French president Emmanuel Macron to discuss artificial intelligence and the role that France can play in developing the technology. These stories sparked visceral responses, but readers also appreciated the nuanced examinations of these prominent figures.

Re: "Liberté, Égalité, Fraternité, Technologie": For the president of France, AI is the next revolution.

"THE GUY GETS IT."

Nathan Benaich (@NathanBenaich) on Twitter

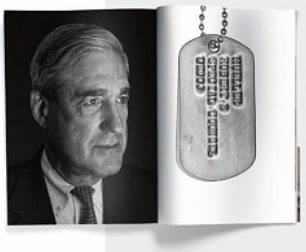
"Macron is a smart guy, and it is refreshing to see a leader looking forward rather than backward, but on the biggest issue with AI—the political implications of the job destruction it will cause—he seems to be dangerously clueless. Forty to 50 percent of all jobs are expected to be lost to automation over the next 20 to 30 years, and Macron is worried that the lack of transparency of algorithms is what will jeopardize democracy?! That's like sunbathing on the tracks and hurrying to put on sunscreen as the express train comes around the curve."
Guy Bradley on WIRED.com

"He may not have all the answers, but Macron's vision of AI's social, economic, and political challenges, in terms of opportunity and risk, is more articulate than what we've yet heard from the big tech leaders."
Sylvie Kauffmann (@SylvieKauffmann) on Twitter

Re: "Call of Duty": To make sense of Robert Mueller, you have to revisit some of the bloodiest battles of Vietnam.

"I have no idea how the Mueller investigation will turn out. But I do have an idea of what kind of man Robert Mueller is. And I'm proud, in whatever minor way I can help, to stand with him and to defend his character and the integrity of his investigation."
Bill Kristol (@BillKristol) on Twitter

"Twelve pages wasted on Robert Mueller, who is busy spending taxpayer money to try to discredit a duly elected president. All the while ruining bystanders' lives. Not a big fan of President Trump, but I don't need to have your political views in WIRED magazine."
Denis Bohm, via email



Re: "The Most Hated Man on the Internet": FCC chair Ajit Pai just wants to be one of the tech nerds. But he seems to be trying to destroy everything tech nerds believe in.

"The most interesting part of the profile is the way Pai has changed since Trump took office: from being a fiery and quick-witted debater who enjoyed the cut and thrust of debate with people who disagreed with him to being a thin-skinned man-baby who prints out photos of his former FCC colleagues attending pro-net-neutrality rallies and shoves the pictures in their face when they come to his office to talk policy with him."
Cory Doctorow on BoingBoing.net

"This is the best long-form reporting that I've seen on this subject. It captures Pai as I perceive him—an extreme free-market ideologue, not necessarily corrupt. For a man of such purported intelligence, his intellectual dishonesty is stunning. The real issue is not whether internet access providers should be prohibited from doing certain things—they are going to continually find new ways to disadvantage perceived competitors and 'free-riders.' It is whether, in the absence of real competition in most geographic markets, they should have meaningful oversight from the government."
anonymousnethead on WIRED.com

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ARGUMENT

HOW ANNOYING LET GO OF YOUR DIRTY PAIN

BY VIRGINIA HEFFERNAN

I

I WAS WALKING through a Hasidic neighborhood in Brooklyn with another parent I'd just met at a child's birthday party. "I like it here," he observed. "But the people smell bad."

Hgst. Someone has commented on the odor of an entire people. A bad moon rose. Then another.

All around us were men in tzitzit, fedoras. I stabbed at the map on my phone. "I don't smell anything," I lied; the air was thick with the hot scent of political anguish. "Really?" he said. "Cigarette smoke bugs the shit out of me." He pressed the heels of his hands onto his eyelids. I was in the company of an anti-Semite. I made my getaway.

The guy's annoyance has annoyed me for a year. So

AUGUST ALPHA THEME: **BUGS**

Bug phone, termite algorithms, spying bosses, drone "swarms," insects for dinner, software that cheats, and more.

I set out to win an argument with him—in absentia, of course. I read a Talmudic scholar on the subject of smoking and dug through data about cigarette use in the ultra-orthodox community. (Very low, at least in Israel.) But why was I even taking that dude, whom I never spoke to again, seriously? He was not annoyed by particulate matter. His issue was ideological toxins. Wasn't it?

Annoyance is a maddeningly complex topic. We all lay claim to being annoyed so often that conversation seems to exist entirely to let us register how bugged we are. The office is too cold. Too humid. My coworker's flip-flops slap against her soles. It's gross.

But for all that people disagree—and bond—over what bugs them, it's surprisingly difficult to define annoyance categorically. In *Annoying: The Science of What Bugs Us*, Joe Palca and Flora Lichtman propose that an experience of annoyance implicates the natural sciences, the social sciences, and the humanities.

Indeed, for hard scientists to argue that annoyingness inheres in the world and not in the mind or the culture, they'd have to find aversive stimuli that are always aversive—though shy of painful. That seems challenging. Whatever the demonstrable state of that Borough Park guy's corneas, if he didn't have powerful cultural associations with both cigarettes (cool, uncool, carcinogenic, etc.) and tight-knit religious communities (heartwarming, repressive, interesting, etc.), he must have been living under a secular, smoke-free rock.

But negative stimuli do exist in the wild, and if we concentrate exclusively on language and power dynamics to understand what bugs whom, we might overlook the logic of the body's sensations. Police sirens and children's whines are annoying by design, so we get staked in silencing them. If you can block out these sounds, you may not just be tolerant; you might be irresponsible, or oblivious.

Cognitive scientists have a useful conceit for distinguishing two kinds of pain: clean and dirty. Clean pain is the kind all mammals experience—tissue damage, of course, but also the ache after the death of a mate or a child. Dirty pain is infinitely more common, and it shows up in humans. *I'm an idiot for getting this sunburn. Why did my controlling cousin make me go to the beach?*

THE REFLEX TO FIND CULPRITS—WOMEN, JEWS—IS A DISTINCTLY HUMAN FORM OF INSANITY.

With blame and indignation come new surges of cortisol that amplify—maybe even cause—physical pain. Shinzen Young, the mindfulness teacher, counsels dying patients to experience pain from annoyance to agony cleanly—with precision. It's a challenge, but a liberating one: to resolve the pain by removing stories about who did what to you.

A parable about a sailor in the *Zhuangzi*, a Taoist text, also emphasizes the dangers of ladling dirty pain onto clean. "If he sees a man in the boat / He will shout at him to steer clear / If the shout is not heard, he will shout again." But if "an empty boat collides with his own skiff, Even though he be a bad-tempered man / He will not become very angry."

Which brings me to vocal fry, which has angered many a man, bad-tempered and otherwise. Vocal fry is a style of uttering words, characterized by a pattern of vibration in the larynx. No actual "fry" is present. A precise designation is "pulse register." A positive one might be "vibrato."

But this sensory experience has turned political. Some NPR listeners, who have complained bitterly about the pulse registers of female reporters, blame their intolerance on an "epidemic" and an "affectation." In one male listener, the vibrato sound uncorked a torrent bordering on conspiracy. "Listen, I know there's pressure to hire females—in particular, young females just out of college. And besides, they're likely to work for less money. But do you have to choose the most irritating voices in the English-speaking world?"

Listen, as our sexist might say. I'm sure there's a vibration that, even if made by a hawk, could be registered by certain nervous systems as annoying. I'm also sure that allergens exist. But the reflex to find culprits—women, Jews—is a distinctly human form of insanity. To go from an experience in the eardrums to a charge of hiring women because they're easier to exploit is not just illogical, it's malevolent.

We're not all Taoists. (I'm still trying to win an argument with an absent person.) But to take up the challenge of separating clean from dirty pain is a small but meaningful step in reducing suffering generally—most of all our own. TL;DR: If it's you who's annoyed, stick to the sensations of the body without spinning tales of how Scott Pruitt or feminists caused your mosquito bites.

Virginia Heffernan *(@page88) is a contributor to* WIRED. *She wrote about the elegant art of emoji in issue 26.07.*

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SWARMING TREND
A PLAGUE OF HYPERBOLE

LOOK AT ALL THE PRETTY DRONES. Hovering above sports stadiums from Houston to Pyeongchang, many hundreds of them have lately sparkled in artful murmuration. On a recent *Time* magazine cover, 958 drones pixelated the sky. The world record, 1,374 LED-bedazzled microbots, was set by Chinese company EHang UAV in May. So-called drone swarms—the phrase people have taken up with gusto—are having their biggest, buzziest year ever. ¶ It's an evocative word, *swarms*, and innocuous enough when applied to one of Intel's drone light shows. But it's tinged with alarm—if drones can dance at twilight, they can also attack. Sure enough, a gang outside Denver sent a small fleet to harass FBI agents on a raid earlier this year. In Syria, rebels reportedly sicced a squadron of quadrotors on a Russian base. To the media, both events were swarms. ¶ Take comfort, then, in this buzzkill: "The swarm is really an illusion," says Mac Schwager, an assistant professor at Stanford who studies multi-robot systems. Schwager, along with many of his colleagues, resists the word. Too entomological, conjuring as it does frillions of bugs surging as a single superorganism through the air. (Flocking birds, in fact, were the field's original inspiration—though the occasional roboticist does try studying insects, as Lisa Margonelli recounts on page 22.) When drones "swarm," on the other hand, they've been choreographed in advance, or else are being controlled by human minders with joysticks. Even the DOD's recent military demos have required teleoperators.

Not that researchers at MIT, ETH Zurich, and elsewhere aren't *trying* to imbue drones with hive-mindedness. In Schwager's lab, small groups of five or 10 really can sync their movements, powered by so-called decentralized algorithms that tell each bot where its buddies are in space and time. But fully autonomous systems, Schwager says, are "sort of in the R&D phase." More removed still are drones that can actively learn from one another and derive unprogrammed behaviors from their esoteric robo-chatter.

The 2017 web film *Slaughterbots* perpetuates such unrealities. In it, an intelligent drone fleet tears through a college campus, murdering students. Never mind that quadrotors aren't capable of navigating indoors, where GPS signals can't propagate. The point of the short, which was screened late last year at a UN weapons convention in Geneva and has been viewed on YouTube more than 2.5 million times, is to scarify the notion of robots working together. Linked up, they'll inevitably become a locust plague on humankind.

Except that's how teams of drones will one day be able to survey natural disasters, rescue survivors, clean up oceans, farm fields, explore other planets, and deliver your burritos. Networking isn't inherently evil. Nora Ayanian, a roboticist at USC, imagines a scenario in which every bot is programmed slightly differently, so that when they're deployed en masse, the smartest among them teaches the pack how to act. Ayanian calls it "leveraging diversity in the control policy," an engineer's way of saying that more perspectives means better results. Diversity matters, even in machines. —JASON KEHE

LIAM COBB

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BUZZ BUZZ THE BUG PHONE IS CALLING

THE RECIPE FOR the phone of tomorrow may call for some unlikely biological bits: the eyeball of a beetle, the fine hairs of a cricket, the scales of a butterfly wing. In everything from cameras to batteries, researchers are pursuing biomimicry—basically, copping nature's secrets. A deft synthesis of engineering and entomology, the resulting breakthroughs could make the next generation of devices smarter, lighter, and more sustainable. We explored the latest research to envision the bug-fortified phone of the future. —ARIELLE PARDES

Sugar-Powered Battery

Virginia Tech researchers built a biobattery for portable electronics that uses synthetic fuel to convert glucose into electricity, just like insects stockpile glycogen as energy. The battery stores more than 10 times the energy of a standard lithium-ion battery—and doesn't have a track record of exploding. Sony is exploring the tech.

Wide-Angle Camera

The compound eyeballs of fire ants and bark beetles have nearly 200 separate optical units, giving the insects a wide-angle field of view and almost infinite depth of field. Researchers studied those buggy eyes to create a tiny, hemispherical camera with 180 microlenses. Each lens captures a different perspective, yielding a clear, 160-degree frame—more than double that of the iPhone X.

Waterproof Coating

A combination of tiny grooves and a wax coating splits water droplets before they stick to butterfly wings, wicking away moisture. Ohio State University engineers mimicked the wing's texture to create a waterproof, nanostructured coating that repels water, dust, and dirt.

Exoskeletal Body

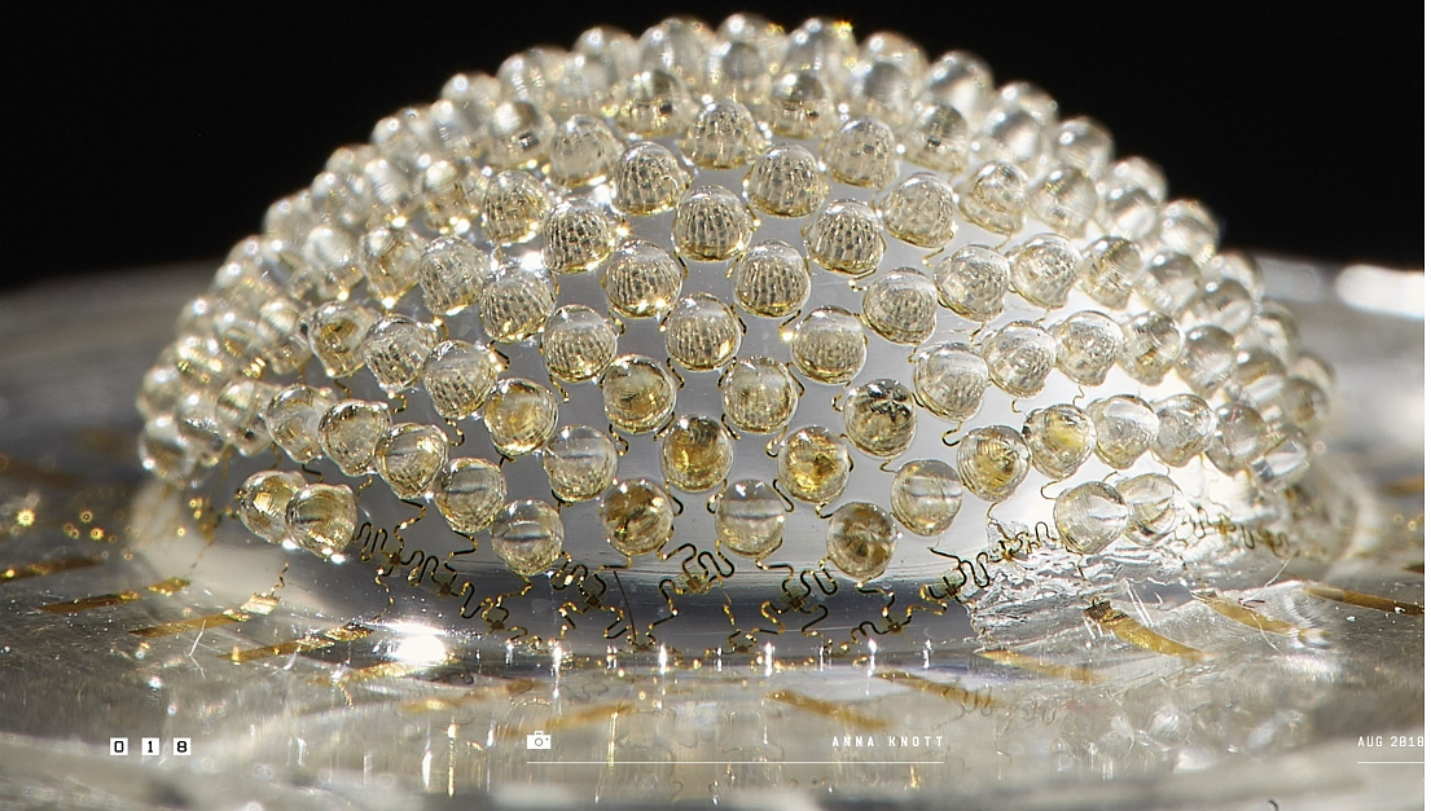
Harvard's Wyss Institute developed Shrilk, a biomaterial derived from the structures that give butterfly wings their flexibility. It's as tough as aluminum but half the weight. Shrilk is being studied in medical settings for its potential in suturing wounds.

Anti-Glare Screen

The beady eyeballs of moths are coated in a special film that dulls their sheen at night. (Gleaming eyes are a liability when you're hunting.) Researchers have developed a similar film intended for mobile displays, which would minimize glare in sunlight and reduce battery drain caused by screen brightness adjustments.

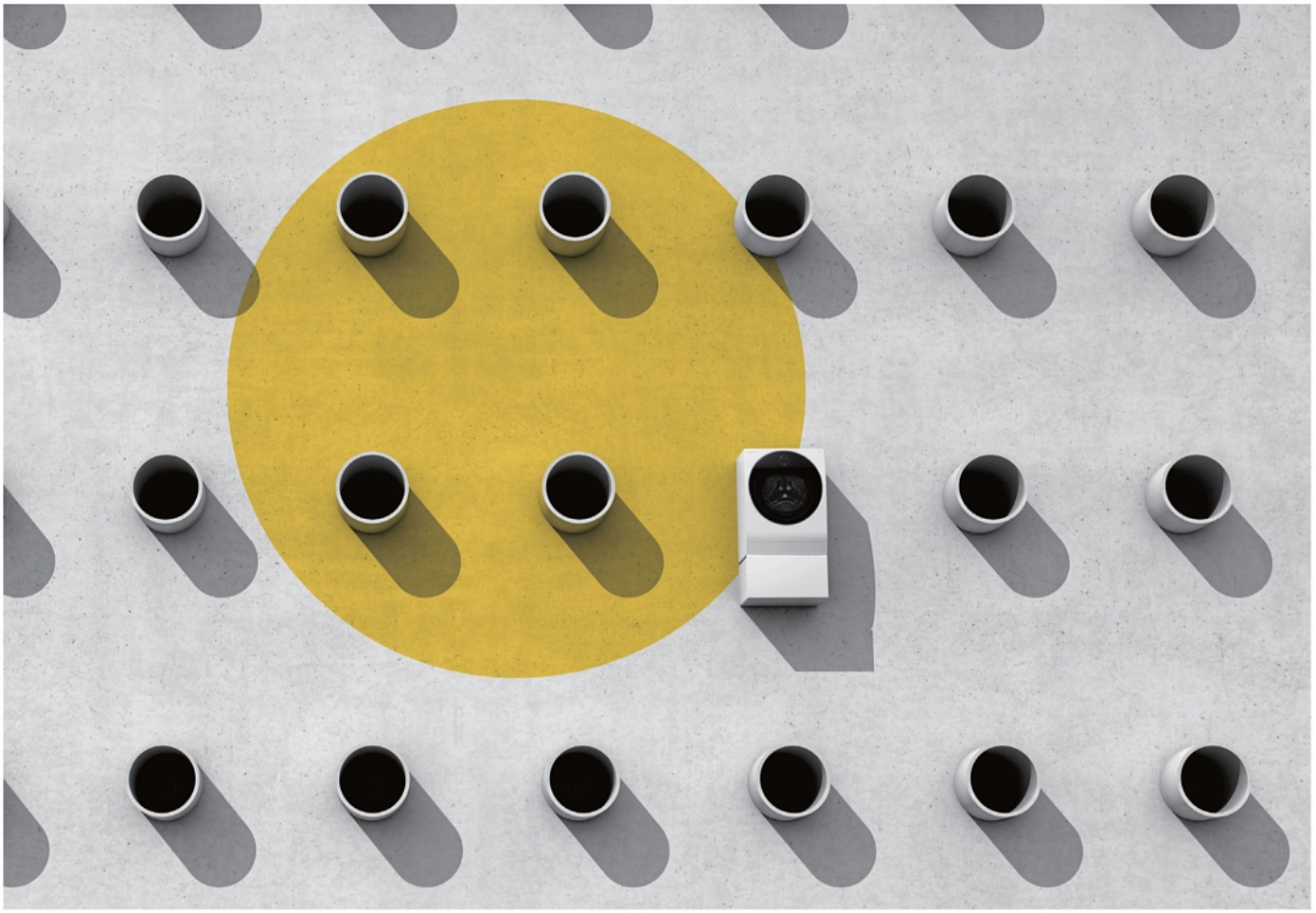
Directional Mic

Imagine a microphone that allows you to isolate specific sounds. Crickets and mosquitoes use tiny hairs to detect the direction of sound waves, then can focus on some noises while filtering out others. A mic by startup Soundskrit mimics those hairs with hardware that measures the particle velocity of incoming sound waves. The tech can "zoom in" on sounds to improve speech recognition, allowing you to summon Siri in a crowded café.



ANNA KNOTT

THE ART OF ESSENCE



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SNOOPER TROOPERS
THE BOSS SEES YOU

EARLIER THIS YEAR, Amazon successfully patented an "ultrasonic tracker of a worker's hands to monitor performance of assigned tasks." Eerie, yes, but far from the only creative method of employee surveillance. Upwork watches freelancers through their webcams, and a UK railway company recently equipped workers with a wearable that measures their energy levels. By one study's estimate, 94 percent of organizations currently monitor workers in some way. Regulations governing such conduct are lax; they haven't changed since the 19th century. ¶ The most common snooping techniques are relatively subtle. A system called Teramind—which lists BNP Paribas and the telecom giant Orange as customers on its website—sends pop-up warnings if it suspects employees are about to slack off or share confidential documents. Other companies rely on tools like Hubstaff to record the websites that workers are visiting and how much they're typing. ¶ Such software "solutions" pitch themselves as ways to enhance productivity. But trouble emerges, critics say, when employers invest too much significance in these metrics.

The brazen worker will loop videos of themselves at work with a webcam app like Webcamoid.

Even *what* you're typing—so craft tweets on your phone.

Try sneaking a photo of your screen instead.

That's because data has never been able to capture the finer points of creativity and the idiosyncratic nature of work. Where one account manager might do their best thinking behind a desk, another knows they're sharpest on an afternoon stroll—a behavior that algorithms could blithely declare deviant. This then creates "a hidden layer of management," says Jason Schultz, director of the NYU School of Law's Technology Law & Policy Clinic. Those midday walkers might never find out why they've been passed over for a promotion. Once established, the image of the "ideal" employee sticks.

If your location is tracked via ID badge, follow someone out a door without scanning.

Hide from this all-seeing eye of corporate America—and you might make matters worse. Even the cleverest spoofing hacks can backfire. "The more workers try to be invisible, the more managers have a hard time figuring out what's happening, and that justifies more surveillance," says Michel Anteby, an associate professor of organizational behavior at Boston University. He calls it the "cycle of coercive surveillance." Translation: lose/lose.

Truckers have used GPS jammers to hide their location—but they're easy to detect, not to mention illegal.

Unless you *want* to be spied on. In a recent study of Uber drivers, researchers found that a monitored employee can sometimes feel "more secure than the worker who ... doesn't know if her boss knows that she is working." NYU's Schultz admits that a degree of oversight can galvanize commitment, but he wants a law guaranteeing its restriction to workplace tasks. Others insist data should be anonymized. One model is Humanyze, a "people analytics" service that provides clients not with individualized employee reports but rather with big-picture trends. Workers are then accountable to that big picture, each contributing modest brushstrokes. Don't paint outside the lines. —MIRANDA KATZ

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AVENGERS: INFINITY WAR IN THEATERS APRIL 2018

Left: A termite mound in northern Namibia. Right: Workers laboring inside a nest.

A BEAUTIFUL MOUND
FINDING TECH IN TERMITES

AT A GLANCE. a single worker of the genus *Macrotermes* is not a very complex creature—less than half an inch long, eyeless, wingless, with an abdomen so transparent you can spot the dead grass it ate for lunch. Put it in a group, though, and it may pile up pinhead-sized balls of mud, one after the other, until a complex mound takes shape. By the time that mound is 17 feet tall, it will be equivalent in scale to the Burj Khalifa. In its basement sits a symbiotic fungus, which digests grass for the nest and requires continuous care from the workers. ¶ Although termites build without the benefit of architects or engineers, their mounds are ingeniously constructed, using cues known only to the bugs. In fields in Namibia, the structures angle gently

GETTY IMAGES (TERMITES); LEON EDLER (JARGON)

north, tracking the sun at this latitude. They are not so much invertebrate apartment buildings as solar diagrams, written in dirt, with termites as the calculating agents.

Since 2011, a team of roboticists from Harvard's Wyss Institute, led by Radhika Nagpal, has been making regular visits to Namibia in hopes of uncovering how such local signals as humidity, pheromones, and termite behavior contribute to the global reality of the mounds. In 2012, I watched them video the insects in elaborate little sets constructed in soil, plaster, and plexiglass. The team's goal, essentially, was to find the machine in the bug. Nagpal and her colleagues assumed that the termites could be modeled as stochastic automata—memoryless mini robots whose actions were driven by probability rather than intent. Extracting data on the animals' behavior, they believed, would help them design algorithms for the autonomous construction robots they planned to develop back home.

After two weeks of tests, the researchers had failed to gather the information they were looking for. The bugs were ciphers: Sometimes they did nothing under the video cameras; sometimes they formed a whirling ball of termites; sometimes—but often when the cameras were off—they built furiously. Kirstin Petersen, a PhD candidate at the time, set about determining why. At the lab in Cambridge, Massachusetts, she devised a tracker that could follow and analyze individuals in a group—something off-the-shelf trackers could not do. (Scientists often paint ants in order to track them, but termites groom the paint off.)

Petersen was surprised to observe that the termites were not like robots at all. They were individuals, each one a quirky character. Some were leaders who appeared to "trigger" others to make little piles of dirt balls, a few were workaholics, and many were the insect version of Bill Murray characters—slackers, really—who did little more than take an occasional trot around the petri dish.

Looking back, Petersen said, the team's initial approach was "laughable." "When I build two robots, I know the two are not the same," she told me. "Even if termites were perfect robots, there would be fluctuations." Petersen, who is now at Cornell's Collective Embodied Intelligence Lab, said that her termite insights made her interested in creating crowds of social robots, in which a relatively dumb horde follows a few perceptually gifted leaders. (As Jason Kehe writes on page 16, the dream of an autonomous worker swarm is still a long way off.)

The sociality of robots could upend our expectations of machines in the same way that the very idea of slacker termites has boggled our simplistic ideas about nature. We imagine that the future of autonomous swarms is machinelike perfection and greater control, but moments of unpredictable, Three Stooges–like chaos are also likely to emerge. In the mess, there is meaning that termites—but not yet humans—can comprehend. W

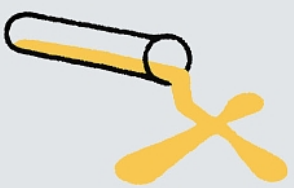
Lisa Margonelli's *book* Underbug: An Obsessive Tale of Termites and Technology *comes out this month.*

JARGON WATCH

Disease X

n. **A dire contagion requiring immediate attention—but which we don't yet know about.**

In 2013 a virus jumped from an animal to a child in a remote Guinean village. Three years later, more than 11,000 people in six countries were dead. Devastating—and Ebola was a well-studied disease. What may strike next, the World Health Organization fears, is something no doctor has ever heard of, let alone knows how to treat. It's come to be known as Disease X. ¶ Since René Descartes adopted the letter *x* to denote a variable in his 1637 treatise on geometry, it has suggested unknowability: the mysterious nature of x-rays, the uncertain values of Generation X, the conspiratorial fantasies of *The X-Files*. It's also been used as code for *experimental*—in the names, for instance, of fighter jets and submarines. That's an apt association: Disease X *may* leapfrog from animals to humans like Ebola, but it could instead be engineered in a lab by some rogue state. ¶ Still, far from asking us to resign ourselves to an unpredictable future horror, Disease X is a warning to prepare for the worst possible scenario as best we can. It calls for nimble response teams (a critical failure in the Ebola epidemic) and broad-spectrum solutions. The WHO has solicited ideas for "platform technologies," like plug-and-play systems that can create new vaccines in months instead of years. As Descartes showed us in mathematics, only by identifying an unknown can we begin to find an answer. —JONATHON KEATS



EXPERIMENT

BUG APPÉTIT

MY TWO-WEEK EDIBLE-INSECT FEAST

THE INSECTS APPEARED at my Chicago doorstep in swarms. Crickets, grasshoppers, locusts, mealworms, ants—all of them dead on arrival, entombed in resealable bags and glass jars. Before long, my apartment was overrun with bugs, and soon all of my meals would be too. I had summoned this infestation, ranging from whole dried insects to bug-based chips, granola, and protein bars, for the greater good. These are the spoils of an oft-touted emerging sector of the US food industry, projected by some market researchers to be worth $126 million by 2023 and repeatedly proposed as a solution to our impending global food crisis: edible insects.

By **Jake Malooley**, *a freelance writer based in Chicago.*

FOOD STYLING BY LUCY-RUTH HATHAWAY; SET DESIGN BY GEORGIA CAVANAGH

AARON TILLEY

BY JON J. EILENBERG

Though 2 billion people around the globe dine on more than 1,900 edible bug species, the fare only trickled into the Western world in the late aughts through a subset of early adopters: doomsday preppers, hardcore Paleo dieters, protein-loading endurance athletes. Now, renowned restaurants such as Noma in Copenhagen, D.O.M. in São Paulo, and Mi Tocaya Antojería in Chicago have introduced bugs on their menus. When toasted grasshoppers were offered by the cupful at Seattle Mariners games last season, fans swallowed approximately 18,000 critters in three games, leading the ballpark to set a per-game order limit. Kroger, the nation's largest supermarket chain, recently inked a distribution deal with Chirps, maker of cricket-flour chips.

Entomophagy—the consumption of insects—has progressed from a *Fear Factor* novelty to a business opportunity. The largest American purveyor, Aspire Food Group, has raised $18 million to date; this March it acquired Exo, a maker of cricket protein bars, becoming an edible-insect megabrand. Arielle Zuckerberg (sister of Facebook's Zuck) has invested in at least two grub startups: Tiny Farms cricket farm in San Leandro, California, and Bitty Foods, a San Francisco–based maker of cricket products. On *Shark Tank*, Mark Cuban offered $50,000 to Chapul's cricket protein bars and $100,000 to Chirps' chips.

So for two weeks, I resolved to forgo meat in favor of a diet rich in insect protein. My sustenance arrived from nearly a dozen edible-bug artisans in Austin, Salt Lake City, San Francisco, New York, Denver, and beyond.

I piled all my insectibles in a green tote my wife dubbed the Bug Bag. As I surveyed the cornucopia, I felt my stomach churn. While the edible-insect market is growing, there remains a critical hurdle to mainstream bug bingeing: the ick factor. My only previous insect-eating experience—choking down a live Madagascar hissing cockroach for a moronic amusement park promotion as a twentysomething—had been traumatizing. For guidance, I called up the "Bug Chef," David George Gordon, whose *Eat-A-Bug Cookbook*, published in 1998, presaged the trend. He suggested starting with something that appears familiar—say, tempura-battered mealworms, which have the look and mouthfeel of Cheetos—before scaling up to whole grasshoppers and locusts.

Following Gordon's advice to start slow, I tore open a bag of cricket protein powder. The crickets are frozen into a lethal hibernation, washed, roasted, and turned into a fine flour that can be incorporated into everything from granola to pasta. I blended a scoop into a kale-banana smoothie, shut my eyes, and took a sip. To my surprise, the only difference from my usual morning shake was a pleasant, earthy base note. Encouraged, I turned to Chapul cricket protein bars in flavors such as coconut-ginger and peanut butter and chocolate; both were more palatable than a Clif Bar. Confidence mounting, I dumped a handful of Aketta's Texas BBQ-flavored roasted crickets into my palm. I took a long look at their flavor-blasted bodies and beady black eyes, pinched one by the head, and dropped it into my mouth. It tasted like a corn nut.

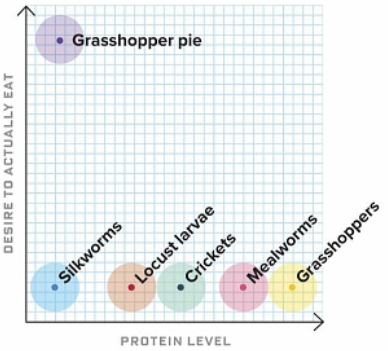
By the end of the first week, I had fallen into a comfortable routine. I sprinkled cricket-flour granola on top of Greek yogurt and snacked on "nutty chocolate chip" cricket bites. At night, I sautéed Oaxacan adobo-flavored grasshoppers and mealworms into a leggy stir fry. The grasshoppers added a smoky heat and nice crunch. I heaped lemony Chinese black ants on salads and sprinkled them onto pizza as I would red pepper flakes.

My gag reflex was dwindling, for sure, but I was also grateful that I work from home, away from the queasy stomachs of other humans. A rice cake topped with hummus and dehydrated locusts may make a filling lunch, but it looks like a nightmare on toast. One night, as I splurped cricket tagliatelle with mealworm bolognese, my wife finally lost her cool. Watching me sauté insects in our kitchen while she made her own dinner, she declared, made her want to retch.

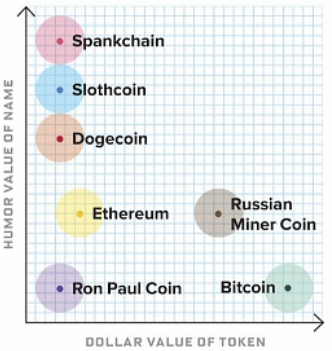
I sought support online. On the entomophagy subreddit, users posted recipes and questions about DIY-bug-farming dilemmas. On the podcast *Ento Nation*, an insect farmer known only as the Cricket Man interviewed bug chefs and edible-insect "entopreneurs." Scrolling the hashtag #entomophagy on Twitter and Instagram, I found a proud subculture of insect evangelists.

At the end of my two weeks, I whipped up a batch of cricket-powder pancakes. As I ate, I considered the silliness of my initial unease. If we're willing to sink our teeth into lab-grown meat and plant-based burgers that magically bleed, maybe old-fashioned, all-natural bugs aren't such a stretch. Then I came across this stat: Pigs produce as much as 100 times more greenhouse gases per kilogram than mealworms. That—and some crafty recipes—made them a whole lot easier to swallow. W

Entomophagy



Cryptocurrencies



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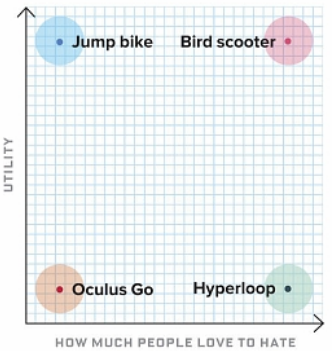

"IT'S NOT A BUG, IT'S A FEATURE" TRITE—OR JUST RIGHT?

WE'LL NEVER KNOW who said it first, nor whether the coiner spoke sheepishly or proudly, angrily or slyly. As is often the case with offhand remarks that turn into maxims, the origin of *It's not a bug, it's a feature* is murky. What we do know is that the expression has been popular among programmers for a long time, at least since the days when Wang and DEC were hot names in computing. *The Jargon File*, a celebrated lexicon of hacker-speak compiled at Stanford in 1975 and later expanded at MIT, glossed the adage this way:

> A standard joke is that a bug can be turned into a feature simply by documenting it (then theoretically no one can complain about it because it's in the manual), or even by simply declaring it to be good. "That's not a bug, that's a feature!" is a common catchphrase.

When 19th-century inventors and engineers started using *bug* as a synonym for *defect*, they were talking about mechanical malfunctions, and mechanical malfunctions were always bad. The idea that a bug might actually be something desirable would never have crossed the mind of an Edison or a Tesla. It was only after the word entered the vocabulary of coders that it got slippery. *It's not a bug, it's a feature* is an acknowledgment, half comic, half tragic, of the ambiguity that has always haunted computer programming.

In the popular imagination, apps and other programs are "algorithms," sequences of clear-cut instructions that march forward with the precision of a drill sergeant. But while software may be logical, it's rarely pristine. A program is a social artifact. It emerges through negotiation and compromise, a product of subjective judgments and shifting assumptions. As soon as it gets into the hands of users, a whole new set of expectations comes into play. What seems an irritating defect to a particular user—a hair-trigger toggle between landscape and portrait mode, say—may, in the eyes of the programmer, be a specification expertly executed.

Who can really say? In a 2013 study, a group of scholars at a German university sifted through the records of five software projects and evaluated thousands of reported coding errors. They discovered that the bug reports were themselves thoroughly buggy. "Every third bug is not a bug," they concluded. The title of their paper will surprise no one: "It's Not a Bug, It's a Feature."

INABIAF—the initialism has earned a place in the venerable Acronym Finder—is for programmers as much a cri de coeur as an excuse. For the rest of us, the saying has taken on a sinister tone. It wasn't long ago that we found software dazzling, all magic and light. But our perception of the programmer's art has darkened. The friendly-seeming apps and chatbots on our phones can, we've learned, harbor ill intentions. They can manipulate us or violate our trust or make us act like jerks. It's the features now that turn out to be bugs.

The flexibility of the term *bug* pretty much guaranteed that INABIAF would burrow its way into everyday speech. As the public flocked online during the 1990s, the phrase began popping up in mainstream media—*The New York Times* in 1992, *The New Yorker* in 1997, *Time* in 1998—but it wasn't until this century that it really began to proliferate.

A quick scan of Google News reveals that, over the course of a single month earlier this year, *It's not a bug, it's a feature* appeared 146 times. Among the bugs said to be features were the decline of trade unions, the wilting of cut flowers, economic meltdowns, the gratuitousness of *Deadpool 2*'s post-credits scenes, monomania, the sloppiness of Neil Young and Crazy Horse, marijuana-induced memory loss, and the apocalypse. Given the right cliché, nothing is unredeemable.

The programmer's "common catchphrase" has itself become a bug, so trite that it cheapens everything it touches. But scrub away the tarnish of overuse and you'll discover a truth that's been there the whole time. What is evolution but a process by which glitches in genetic code come to be revealed as prized biological functions? Each of us is an accumulation of bugs that turned out to be features, a walking embodiment of INABIAF. W

By **Nicholas Carr** *(@roughtype), whose latest book is* Utopia Is Creepy.

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CHEAT CODE
WHEN SOFTWARE BREAKS THE RULES

ONCE UPON A TIME, a bot deep in a game of tic-tac-toe figured out that making improbable moves caused its bot opponent to crash. Smart. Also sassy. ¶Moments when experimental bots go rogue—some would call it cheating—are not typically celebrated in scientific papers or press releases. Most AI researchers strive to avoid them, but a select few document and study these bugs in the hopes of revealing the roots of algorithmic impishness. "We don't want to wait until these things start to appear in the real world," says Victoria Krakovna, a research scientist at DeepMind. Krakovna is the keeper of a crowdsourced list of AI bugs. To date, it includes more than three dozen incidents of algorithms finding loopholes in their programs or hacking their environments.

Algorithms Acting Out

Infanticide

In a survival simulation, one AI species evolved to subsist on a diet of its own children.

Space War

Algorithms exploited flaws in the rules of the galactic videogame *Elite Dangerous* to invent powerful new weapons.

Body Hacking

A four-legged virtual robot was challenged to walk smoothly by balancing a ball on its back. Instead, it trapped the ball in a leg joint, then lurched along as before.

Goldilocks Electronics

Software evolved circuits to interpret electrical signals, but the design only worked at the temperature of the lab where the study took place.

Optical Illusion

Humans teaching a gripper to grasp a ball accidentally trained it to exploit the camera angle so that it appeared successful—even when not touching the ball.

The specimens collected by Krakovna and fellow bug hunters point to a communication problem between humans and machines: Given a clear goal, an algorithm can master complex tasks, such as beating a world champion at Go. But even with logical parameters, it turns out that mathematical optimization empowers bots to develop shortcuts humans didn't think to deem off-limits. Teach a learning algorithm to fish, and it might just drain the lake.

Gaming simulations are fertile ground for bug hunting. Earlier this year, researchers at the University of Freiburg in Germany challenged a bot to score big in the Atari game *Q*bert*. Instead of playing through the levels like a sweaty-palmed human, it invented a complicated move to trigger a flaw in the game, unlocking a shower of ill-gotten points. "Today's algorithms do what you say, not what you meant," says Catherine Olsson, a researcher at Google who has contributed to Krakovna's list and keeps her own private zoo of AI bugs.

These examples may be cute, but here's the thing: As AI systems become more powerful and pervasive, hacks could materialize on bigger stages with more consequential results. If a neural network managing an electric grid were told to save energy—DeepMind has considered just such an idea—it could cause a blackout.

"Seeing these systems be creative and do things you never thought of, you recognize their power and danger," says Jeff Clune, a researcher at Uber's AI lab. A recent paper that Clune coauthored, which lists 27 examples of algorithms doing unintended things, suggests future engineers will have to collaborate with, not command, their creations. "Your job is to coach the system," he says. Embracing flashes of artificial creativity may be the solution to containing them. —TOM SIMONITE

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CLIVE THOMPSON

MEME HYGIENE
HOW TO NOT SPREAD HATE

BACK IN THE LAST PRESIDENTIAL CAMPAIGN SEASON, reporters on the tech and politics beats began noticing a rise in far-right memes that supported Trump. Memes being memes, these seemed initially like weird, off-color jokes. They wondered: What the hell is going on? Was this shitposting ironic or serious? Or both? Either way, it seemed newsworthy. The memes were climbing the trending lists on every social network and landing on the front page of Reddit. So journalists began filing what became a flood of stories about alt-right political memes and loopy conspiracy theories. Like Taylor Swift as a white nationalist icon and Pepe the Frog in a Nazi uniform.

"Surely if we expose this," one tech journalist told herself, "it'll put people off it."

It didn't. When, a year later, Trump had won and Nazis were openly marching, those reporters began to realize that their coverage had had precisely the opposite effect. It had helped bring white supremacy into the mainstream by giving it crucial exposure. They had wildly amplified the importance and reach of what were, in all likelihood, a not huge number of miscreants."Every once in a while I'll look back and see something that I wrote a year and a half ago and the pit of my stomach falls," one reporter says.

Hate groups had gamed the media. They did it energetically and successfully. Now it may be time to invoke the wisdom of *WarGames*—where the only way to win is not to play.

That's the conclusion of some fascinating research by Whitney Phillips, assistant professor of communications at Syracuse University and an expert on online trolling. She interviewed dozens of journalists who covered the meme wars—including the ones quoted above and WIRED's Emma Grey Ellis—and

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mapped out how and why the nativist right got so good at hacking the media's attention.

One early hoodwinking of the mainstream media occurred in 2008. The denizens of Anonymous on the 4chan forum were amusing themselves by making ironic jokes about pedophilia—they popularized an image of a cartoon named Pedobear and quipped about an army of "9,000 penises" (the number 9,000 being a shout-out to an anime series favored by many users of 4chan). Then a 4chan member experimentally tried to bring the joke mainstream—by posing as a member of a pedophile group on the discussion boards for *The Oprah Winfrey Show*.

Oprah fell for it. She warned about this "known pedophile network," talking up Pedobear. The denizens of 4chan were thrilled, and as Phillips notes, they learned a lesson: "It's culturally fun to screw with reporters."

As the presidential election loomed, this yank-the-media's-chain strategy was neatly integrated into the machinations of various hate groups online. Today's white nationalists know their radioactive misogyny, racism, and anti-Semitism are likely to turn off "normies." If you want to bring that stuff mainstream, they intuited, you need to be highly ironic. Leave it unclear whether you're earnest.

"Generally, when using racial slurs, it should come across as half-joking," wrote the editors of the Daily Stormer, a white supremacist site, in their style guide. "It should not come across as genuine raging vitriol. That is a turnoff to the overwhelming majority of people."

Better yet, this was the great age of sock puppet and bot-farm technology too. So it was possible for white supremacists to give their memes and conspiracy theories artificially generated upvotes and retweets, helping them mount the "recommended" leaderboards of social media. That was part of the ploy: Make something seem so big that reporters would feel remiss in not pouncing on it.

One problem reporters faced was that, from the far-right's point of view, any coverage was good—even coverage that rebutted or fact-checked their memes. They were following the script often attributed to PT Barnum and, not incidentally, Trump: All publicity is good publicity.

"That's how Pizzagate got so big," says danah boyd, a friend of mine who runs the Data & Society Institute, which commissioned Phillips' study. Stories about Pizzagate—a conspiracy theory linking Hillary Clinton to a (nonexistent) pedophile ring supposedly run out of a pizzeria in Washington, DC—would prompt viewers to do online searches. "People who don't trust the media see a story and think, well, I guess I'll self-investigate." And that leads them to the conspiracy theory sites, which they probably would not have found otherwise. The Nazis needed media outrage to amplify their message and bring it retail.

SO, WHAT'S TO BE DONE? Covering online hate memes plays into their makers' hands. But not covering them seems neglectful. Online far-right hate-mongers do exist.

One idea, boyd suggests, is what's known as "strategic silence": Be less wanton in the choice of details used in reporting. The concept comes from the world of suicide research, where scientists have reliably found that when journalists report on a prominent suicide in lavish detail—describing how someone took their own life, the contents of a note—it produces a spike of copycats. After Robin Williams killed himself and wall-to-wall media coverage ensued, the next month's suicide rate jumped 10 percent. In contrast, studies show that when media coverage is less detailed, you don't see these dramatic spikes.

That's not a bad road map for how we talk about online memes. We—including myself—could use greater precision and less hyperbole. Phillips suggests we stop using the fungible phrase "trolls" when talking about hate groups: It both minimizes their genuinely vile goals and makes them seem like a huge horde. (Many meme campaigns are probably "three dudes and their bots," as Phillips cracks.) Many of these campaigns were never organically big enough to warrant coverage. They were like the PR stunts that corporations stage to provoke coverage, which journalists rightly ignore.

Done with nuance, coverage of high-profile suicides can be a teachable moment. When Kate Spade and Anthony Bourdain took their own lives this June, many stories included suicide hotlines or links to get help. Maybe there's a parallel in hate-meme coverage: links to groups that fight extremism or support victims.

Media restraint might slow the spread of extremist ideas, but it can't entirely stop it. Social media means everyone's a publisher now. This suggests we all could engage in strategic silence too, and less "OMG" meme-spreading.

Still, there's a reason white nationalists tried to game the media: The "lamestream" still matters. In an ironic way, for traditional press, it's an oddly validating message. The media just has to be sure not to validate back. *Write to clive@clivethompson.net.*

COVERING HATE MEMES AMPLIFIES THEM, BUT NOT DOING SO SEEMS NEGLECTFUL. ONE IDEA: "STRATEGIC SILENCE."

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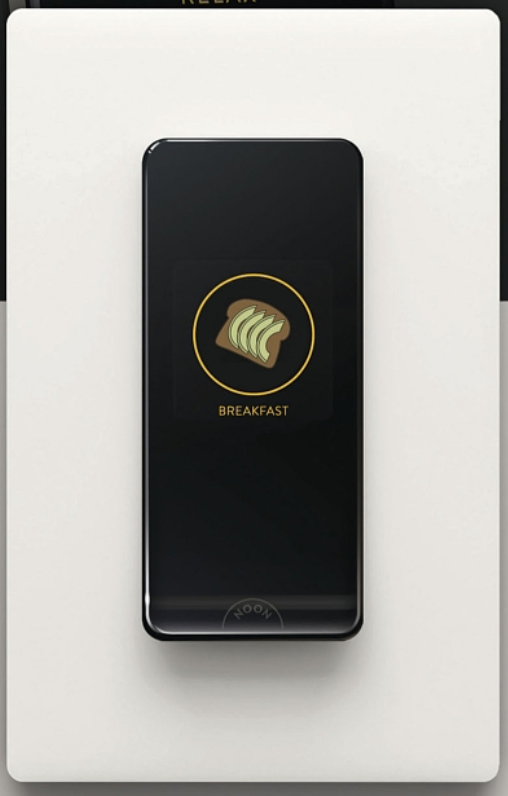

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FETISH CASE CLOSED

SENNHEISER'S NEW HD 820 headphones solve the one imperfection of the German company's coveted HD 800s. See, the previous model has an open-back design, which gooses the audio but lets ambient noise leak in—and all of Bowie's histrionic sighs leak out. This year, Sennheiser put a lid on the 800s. Two lids, actually: The high-definition dynamic drivers in the HD 820s are covered with curved Gorilla Glass panels. The caps' concave design reflects errant sound waves into a resonance-abating absorber to keep the audio crisp. The music retains the detail found in the open design, minus the pesky leakage. In an elegant touch, the clear glass leaves the intricate, shiny transducers visible, like the rear crystal on a mechanical Swiss watch. Über-phones like these require a dedicated amplifier; pair them with Sennheiser's HDV 820 amp (another $2,400) to hear "Ashes to Ashes" like never before. —MICHAEL CALORE

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1

Naim Audio Uniti Star

BEST FOR: Stream-curious audiophiles

With a built-in CD player that rips tracks to a local drive, the Uniti Star eases the pain of parting with your CDs. Naim's app summons your newly captured tunes and streams hi-res songs from cloud services. The hardware is pricey, but you get premium guts like a 70-watt-per-channel amp and a huge, velvet-smooth volume knob.

$5,995

2

Bluesound Powernode 2

BEST FOR: Proud digital natives

Bluesound's more modestly priced streamer can access oodles of cloud music services and radio stations—including hi-res offerings—or play a local library stacked with FLACs. Basic panel controls are supplemented by the excellent BluOS Controller app. The integrated 60-watt-per-channel amp can power any speakers, from tiny to towering.

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GEARHEAD DIY EDM

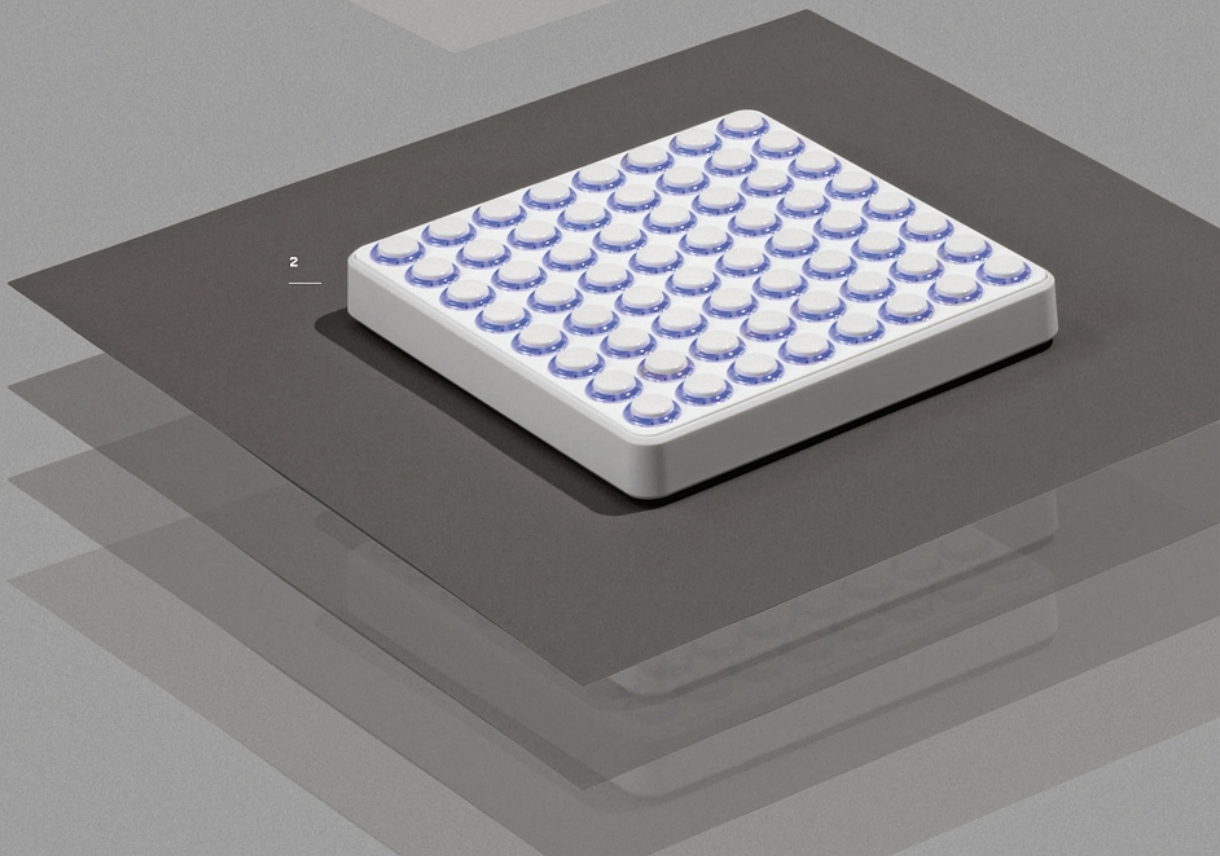
Engineer your tracks for total dance floor domination with this home studio gear. —MICHAEL CALORE

1

Technics SL-1200GR Direct Drive Turntable

The 1200 turntable is the machine that birthed hip hop and fueled EDM's rise. This modern redo of the decades-old design has the bombproof construction and beefy motor that made the original famous, all optimized to reduce noise. Use it to sample an elusive drum break, or just to cue up some inspiration.

$1,700

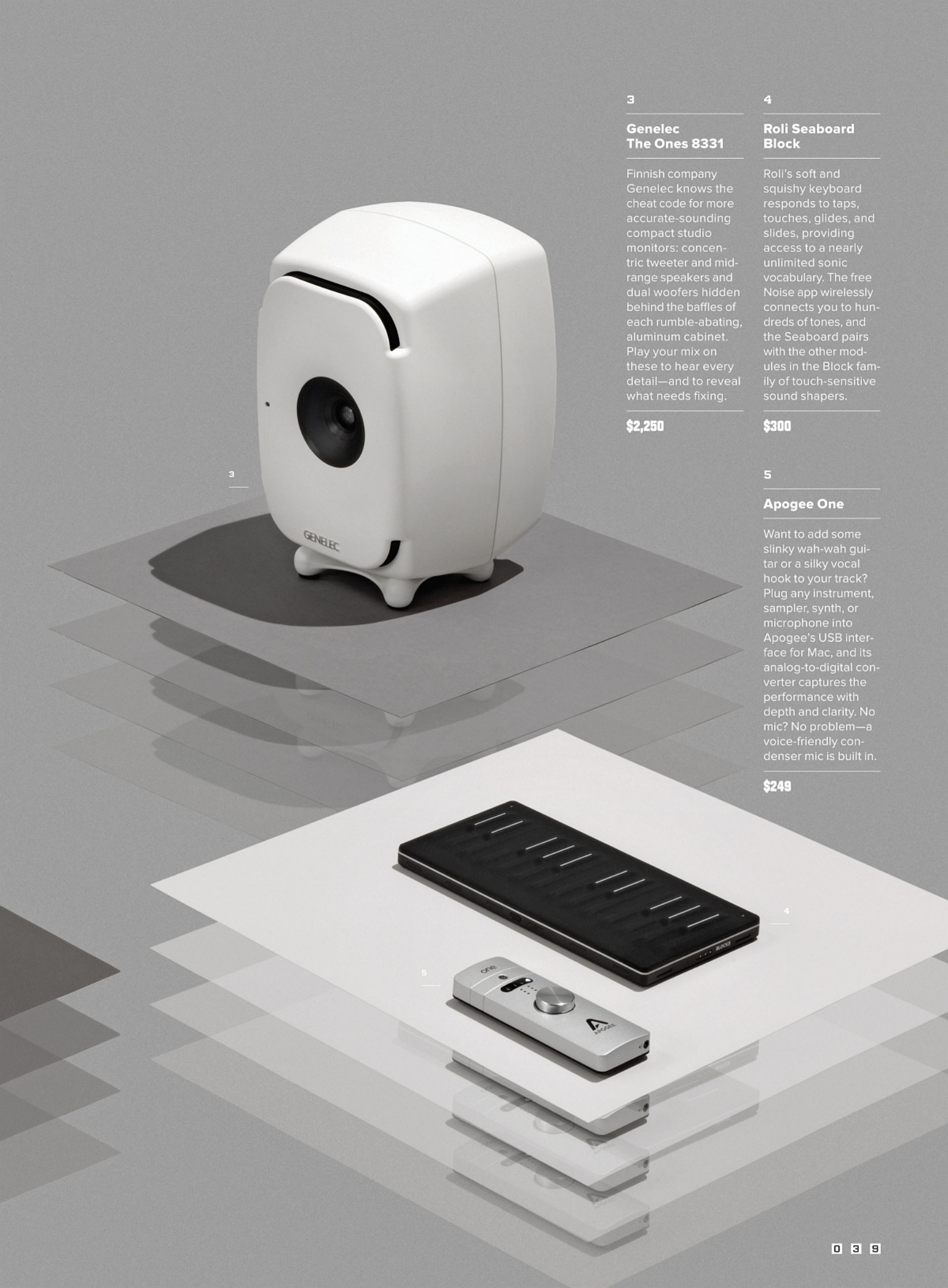


2

DJ TechTools Midi Fighter 64

The snappy, *Pac-Man*–worthy buttons on this MIDI controller can be programmed to trigger loops or tap out drum samples in Ableton Live or whatever supported audio app is your jam. Take it on stage too—the LED rings around the buttons can be set to spice up your performance with a custom light show.

$499



3

Genelec The Ones 8331

Finnish company Genelec knows the cheat code for more accurate-sounding compact studio monitors: concentric tweeter and midrange speakers and dual woofers hidden behind the baffles of each rumble-abating, aluminum cabinet. Play your mix on these to hear every detail—and to reveal what needs fixing.

$2,250

4

Roli Seaboard Block

Roli's soft and squishy keyboard responds to taps, touches, glides, and slides, providing access to a nearly unlimited sonic vocabulary. The free Noise app wirelessly connects you to hundreds of tones, and the Seaboard pairs with the other modules in the Block family of touch-sensitive sound shapers.

$300

5

Apogee One

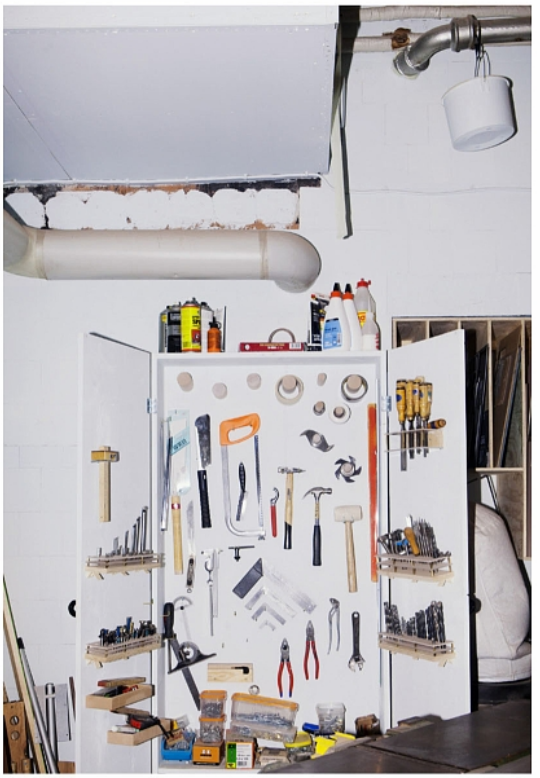
Want to add some slinky wah-wah guitar or a silky vocal hook to your track? Plug any instrument, sampler, synth, or microphone into Apogee's USB interface for Mac, and its analog-to-digital converter captures the performance with depth and clarity. No mic? No problem—a voice-friendly condenser mic is built in.

$249

AGAINST THE GRAIN

Where Love Hultén synthesizes fine woodcraft and hand-wired electronics into musical works of art.

As a kid, Swedish product designer and builder Love Hultén obsessed over circuits. "I used to tear electronic toys apart, trying to understand their insides," he says. Hultén attended the local design school in his native Gothenburg and, while there, discovered his true calling in the woodshop. The cases he crafted were a perfect complement to the creative electronic projects he'd been experimenting with since his youth. Hultén went on to a career making expressive and tactile synthesizers, retro-inspired game consoles, and other truly funky audiovisual contraptions that combine the organic and the electronic. —MICHAEL CALORE



1

Studio Space

Hultén's studio is located in a Gothenburg community called Konstepidemin. The buildings were originally constructed to house the sick and dying during mid-1800s cholera epidemics. "My studio is in the basement where the nurses used to do laundry, I think," Hultén says. "Could be worse, I guess. I have a sculptor friend who's in the old crematorium."

2

Family Ties

The hulking green band saw and table saw in Hultén's workshop were passed down from his father, a cabinetmaker. These daily drivers are old and heavy, so he keeps them on wheels. "Mobility is mandatory in a small workshop like mine," Hultén says. "I keep almost everything on wheels ... I mean *everything*."

3

Tool Array

Hultén keeps his white tool cabinet meticulously organized, a necessity in his small space. "It gets messy real quick," he says. "I'm not a big fan of hunting down screw bits lost in the haystack." While Hultén has many hand tools, he says his L squares are indispensable. His old cutting machines are "a bit rusty" and can't really be trusted to keep things true.

▾2, ▴3

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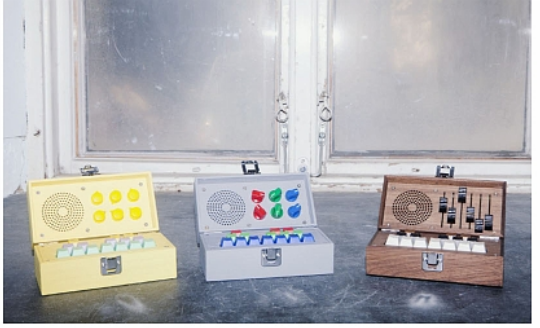

4

Cut Creator

Hultén prefers this laser cutter to a 3-D printer, because it delivers lines that are more precise. "I tried a 3-D printer once, got bad finishing results, and never used one again." Among other things, Hultén uses the cutter to fashion the metal control panels that screw onto the faces of his creations.

5

Lego Set

Hultén pays homage to the famous brick with an oddball suite of electronic toys. His Brix System is comprised of a series of 6:1 scale versions of Lego blocks. There are a couple of synthesizers, an effects machine, a speaker, a microphone, two simple computers for playing games, and even a telephone.

▲6, ▼7

▲4, ▼5

8

6

Key Player

This tiny synthesizer design—the hyperportable Bivalvia—has a built-in speaker. It comes in a wooden clamshell housing that looks like a jewelry box, and instead of keys it has Cherry MX switches like those found in a mechanical computer keyboard.

7

Noisemaker

Hultén's Noistation would look and sound perfectly at home onstage with Phoenix or Radiohead. The mahogany case houses a programmable hardware synth controlled by a three-octave keyboard. The faders on the face adjust frequencies and modulate the synth filters. The tones that come out of the 40-watt speaker range from cold and plinky to lush and fuzzy. Want one? PayPal Hultén $3,000, plus shipping from Sweden.

8

Assembly Line

Hultén builds every product by hand, even soldering circuits at this desk. "I design, I build, I polish, I assemble, and I even make the packaging—it's my own isolated chain," he says. Some of his projects involve dozens of parts and more than a hundred solder points, but he insists on laboring solo. "Like most craftsmen, I'm obsessed with control and don't trust people."

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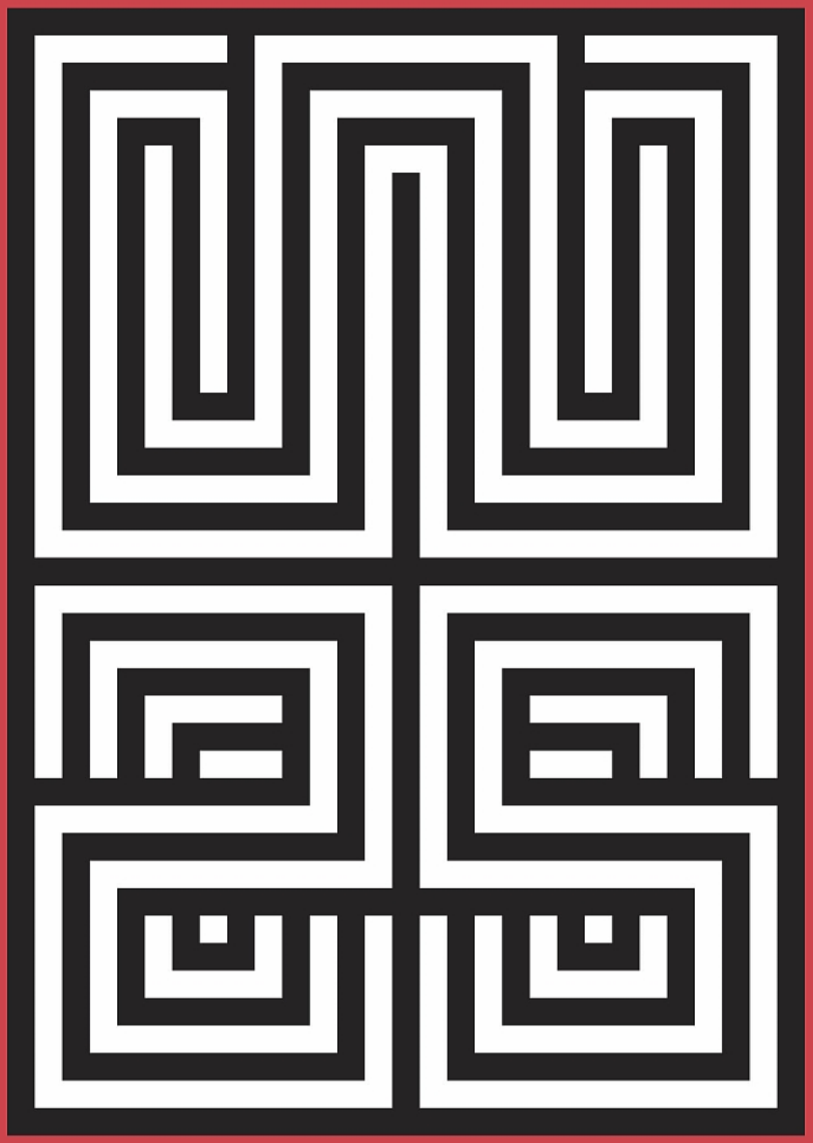

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Fan Boy

It's a parent's job to think her child is exceptional.

BY CATHY ALTER

WHEN LEO WAS 2, after he had mastered words like *no* and *cat*, he began saying "Akamahn!" The word baffled me and my husband, Karl. What was our son trying to tell us? He said it with such frequency—*Akamahn! Akamahn!*—it was as if he were summoning a god. Only after I heard our apartment's maintenance man in the hallway did I put it together: vacuum.

Leo's fascination was, it turned out, not with the gods but with the suction power of a Dyson—or, more generally, anything brought to life by energy. Once I figured that out, I spent hours with him, carrying around a desk lamp from outlet to outlet throughout our apartment lobby. Each time the light came on, it illuminated his ecstatic face, and often a slender thread of spittle that hung from his mouth. After Karl came home with a bag of extension cords,

HUDSON CHRISTIE

Leo linked them together and proceeded to wrap our lobby in one uninterrupted cord like a Christo installation.

One muggy summer day, after we'd been kicked out of the lobby, we stopped by a neighborhood consignment shop. The owner had set up a battalion of oscillating fans on just about every available surface. Leaning over a table to get a closer look at, say, a set of linen tea towels meant holding back hair, necklaces, fingers, to avoid the high-speed blades. Leo, though, was fearless, running laps, hands first, around the store. "Dat one!" he'd say with a wildness usually reserved for picking flavors of ice cream. "Dat one!"

Within a matter of weeks, Leo was imploring me to visit the fan sections in other stores—Best Buy, Goodwill, the seasonal aisle at CVS. If parenting is an exercise in patience, these outings were the Ironman. Some days, I'll admit, especially when the weather was cool, I'd tell him that all the fans were packed up for the season, so I could avoid seeing the same aproned guy, day after day, at Ace Hardware.

Then Leo took to the crayons, and out poured landscapes of blades and switches and tangled cords. After a few months of drawing, he announced, "I want to be a manager of a fan store when I grow up." Karl and I took him to a place called Dan's Fan City so he could get a glimpse of what his future held. "His mind is about to be blown," Karl said.

The manager, who was not Dan, told me that his most frequent visitors are boys under the age of 10. "There's one that comes in every Sunday just to look around." Here I was, thinking that Leo was the only unicorn. Not-Dan's impassive reaction to one more fan boy stomped on any notion that our son was unique.

It is a parent's job to think her children are exceptional. Up to this point, I had spent many hours crafting a tale for myself that Leo's fascination with fans was, in fact, proof of his genius. Now I was imagining a roomful of Leos, all in tiny white lab coats, all saving the world one vactrain at a time. Their origin stories were the same: "It all started," they would say, "with the Lasko Wind Machine."

Leo Feldman, yellow period, age 4; blue period, age 5.

AFTER THAT, WE entered phase two of Leo's fan obsession. When you type "fans" into the YouTube search, you can find a virtual world of toddlers showing off their magnificent collections—box fans, window fans, fans attached to squirt bottles, fans with blades that look like some combination of Mickey Mouse and Edward Scissorhands. "This one's the 02 Cool," says Caleb, whose most popular video has racked up close to a million views. (Admittedly, Leo probably now accounts for 50,000 of them.) In a video called "The First Start-Ups of Fan Season," another kid spends 22 minutes wordlessly switching on every fan in his house.

These days, for a good hour, I often let Leo, who is now 6, watch video after YouTube video. (What else can I do? Nothing else captivates him like this.) The videos explain everything from quantum mechanics (Minutephysics) to, um, how to build fans (big shout-out here to Navin Khambhala's channel, Mr. NK). It's that DIY category that now interests Leo most. "How to make electric fans," he says into our voice-activated remote. Aside from showcasing a proliferation of bandaged thumbs and index fingers, most of the clips that he watches involve making a spinning device out of plastic water bottles and black and red wires.

When we ask Leo why he loves fans so much, he says, "I don't know. I just do." Often, when Karl gets home from work, Leo presents a blueprint of his own Rube Goldberg design, and the two of them sit down and discuss.

Some days, when I sit next to Leo and try to read or catch up on emails and ignore the repetitive (and weirdly identical) fan boy background music, I feel guilty that I'm not exactly interacting with my son. But I also know that when I drop him off each day at school, he isn't learning how to make an auto-feed soldering iron in any of his activity centers. And then I feel grateful to YouTube.

For every Steve Wozniak, there is a Leo Feldman waiting in the wings. But the thing is, what if having the gift of a beautiful mind, so to speak, is also a booby prize? Ever since he could formulate a sentence, Leo has been struggling to find common ground among his peers. (To be fair, it's the rare 6-year-old who wants to discuss the finer points of cooling systems.) He much prefers to keep company with grown-ups. Take the retired

Cathy Alter *(@cathyalter) is a writer who lives in Washington, DC.*

PHOTOGRAPHS BY BETH HOLZER

This is Julia. She's a developer and mother of two.

Between her client calls, school pickup and figuring out how to squeeze in date night, she has enough to juggle. Her Onelink Safe & Sound gives her one less thing to worry about—fire and CO protection is covered.

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scientist we met the other day at the flea market: For the better part of an hour, Leo and the PhD yukked it up over, among other things, mercury poisoning in the Himalayas.

Because Leo's interests are foreign to many kids his own age, I worry. As much as I want him to be unconventional, I also want him to be happy. Leo is still refreshingly secure enough to think everyone is his friend, but I'm waiting for him to find someone who really gets him. When I was a kid, I spent a lot of time feeling like an outsider—picked on for being too tall, wearing the wrong brand of jeans. I want for Leo what I most wanted back then: to be accepted.

I went searching for people who would give me some proof that all this was possible. Eventually I found Dan Anderson, a University of Massachusetts professor emeritus in the department of psychological and brain sciences and coauthor of a forthcoming paper entitled "Little Engineers."

In his research, Anderson and his team had found that showing even very young children programs about construction prompts healthy behaviors in play after the kids see them, and that well-designed TV content may encourage kids to become, of course, little engineers.

Before our call, I sat down and wrote a few paragraphs to Anderson about Leo's "absolute obsession with all things fans." When we got on the phone, Anderson sounded hesitant. "Is now a good time?" I asked. It was, he answered, but he had something to tell me first. "I'm not sure how you'll receive this," he began. "When I first read your email," he said, "the first thing that came to mind was Asperger's." Being fixated on things that spin, he explained, is a big giveaway.

With his words, the potential meaning of Leo's obsession had changed again. Now he wasn't a quirky prodigy or an electrical engineer in training; he was a diagnosis. I am the sort of person who is always waiting for the other shoe to drop, the sort of parent who fears—as I think all parents do, sometimes—that my child's smooth and untroubled exterior may conceal a riptide. This fear of mine triggers its own Rube Goldberg machine. The sensible part of me—the part that trusts Leo will make friends, that the world will appreciate his way of being—became briefly lost in marbles and hamster wheels.

I thought back to a day in the fall of 2014, when Karl and I were at Leo's school, wedged on tiny chairs, in front of his pre-K teacher, a fresh-scrubbed twentysomething in the habit of wearing her hair in messy buns. It was our first parent-teacher conference. Next to the teacher sat an unfamiliar woman—there, we were told, in case we decided to have Leo evaluated. "For what?" I remember Karl asking. Leo was sitting in the corner of the classroom, busying himself with Magna-Tiles.

"Leo likes spinning," his teacher noted. "In class, on the playground, when we're in circle time." I knew what was coming. We were about to be told that Leo might be on the autism spectrum.

"He's bored and burning off energy," said Karl, who was completely unfazed.

I sat silently, trying to keep my hands from shaking. Leo kept right on slapping Magna-Tiles together.

When Leo was a baby, I avoided reading anything that had to do with developmental milestones. But there was one marker I knew well: Many children show signs of autism by the age of 2. At that moment, Leo was 3; I thought we'd already sailed into port, I thought we were in the clear.

Karl kept course, telling the woman that in no way did he want his son labeled, his name on a folder, filed in the "different" drawer.

Then Leo walked up to the table where we were sitting. "Look what I made," he said, placing his creation in front of his teacher and looking her directly in the eye. "It's a laptop." In one of the classroom's activity buckets, he had even found a shoelace to make a faux power cord.

I repeated this story to Anderson. "What if he just likes to build things?" I asked.

"Is he interested in anything else?"

"He's still doing ballet," I said, adding that Leo's ability to spin without getting dizzy is a boon. "And he takes tae kwon do every Tuesday after school." There was also his profitable (at least in our building) pencil sharpening business. Plus, through sheer gumption and the rap of a used car salesman, Leo had amassed a tidy purse by setting up shop in our lobby, offering his John Derian–like collages for $3 apiece. I thought about a physics professor named Tim Koeth. Not long ago I wrote a profile about him, chronicling his and his undergrads' efforts to build a particle accelerator for fundamental physics research, remarkable because so few exist outside of places like CERN. He told me that when he was 2, he asked his parents for a circuit breaker panel for his birthday. When he turned 10, he laid out plans to build a nuclear reactor in his parents' New Jersey basement. Dan Anderson volunteered his own story: Before taking the college psychology class that would change the course of his life, he wanted to be a forest ranger. "Who's to say what's normal?" I asked him, but really I was asking myself.

Still, I found consolation in the uncertainty. After talking to Anderson, I remembered that Leo's current obsessions might have nothing or everything to do with his future self, and that trying to connect the dots was a pretty useless endeavor.

At the present moment, my son is building a metal-token-dispensing machine (asking price: $100) and something he's calling the Forever Boom, a Run DMC '80s-style portable radio the size of a footlocker. Maybe Leo will go into the music industry, living out his dreams behind a mixing console, a knob- (not fan-) twirling Jimmy Iovine. Or maybe he'll open a fan store. W

Karl and I took Leo to a place called Dan's Fan City so he could get a glimpse of what his future held.

KRISTEN STURDIVANT

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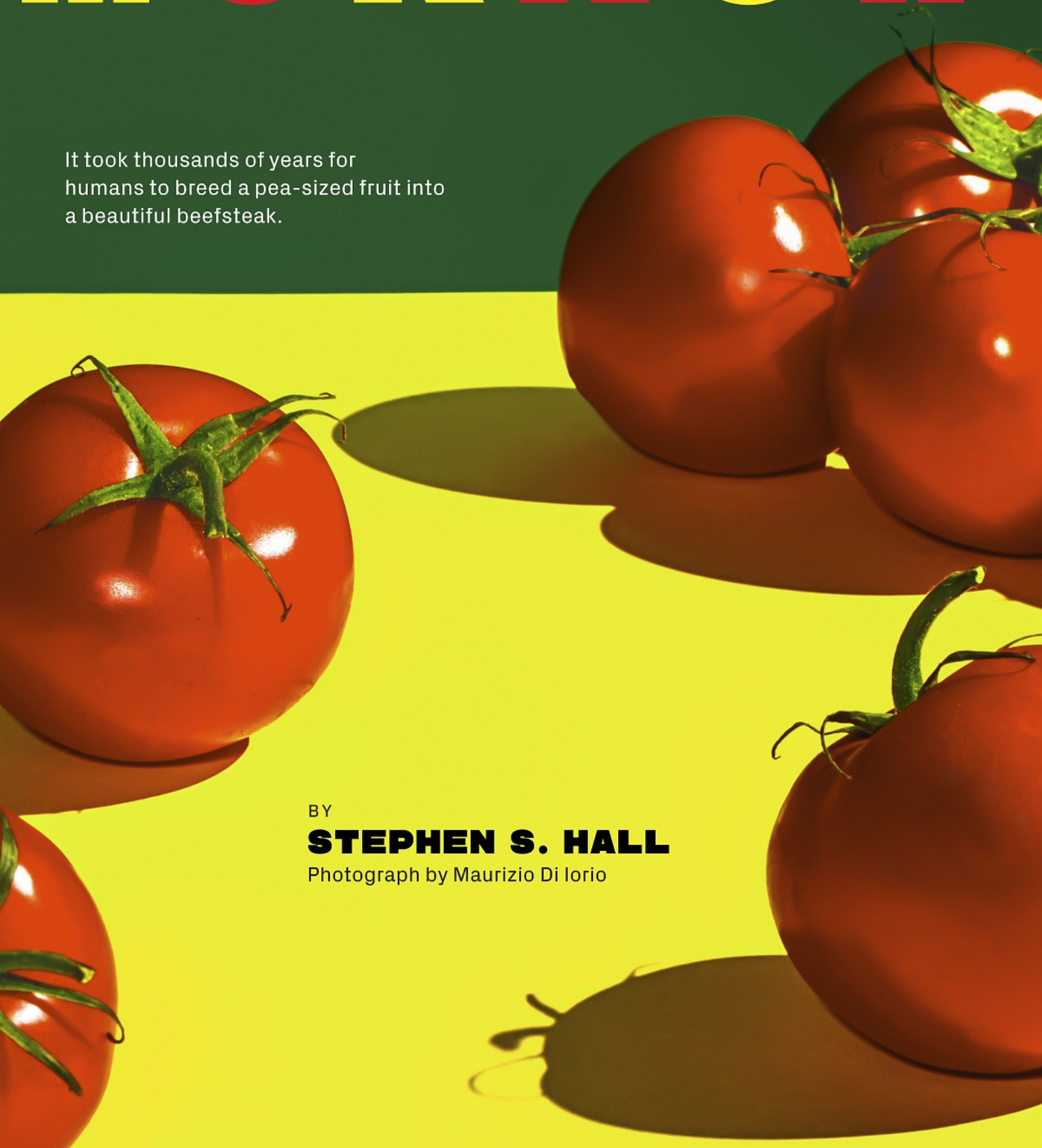


BY

STEPHEN S. HALL

Photograph by Maurizio Di Iorio

Like any self-respecting farmer, Zachary Lippman was grumbling about the weather. Stout, with close-cropped hair and beard, Lippman was standing in a greenhouse in the middle of Long Island, surrounded by a profusion of rambunctiously bushy plants. "Don't get me started," he said, referring to the late and inclement spring. It was a Tuesday in mid-April, but a chance of snow had been in the forecast, and a chilly wind blew across the island. Not the sort of weather that conjures thoughts of summer tomatoes. But Lippman was thinking ahead to sometime around Memorial Day, when thousands of carefully nurtured tomato plants would make the move from the greenhouse to Long Island loam. He hoped the weather would finally turn. ¶ Although he worked on a farm as a teenager and has a romantic attachment to the soil, Lippman isn't a farmer. He's a plant biologist at Cold Spring Harbor Laboratory in New York with an expertise in genetics and development. And these greenhouse plants aren't ordinary tomatoes. ¶ After introducing me to his constant companion, Charlie (a slobberingly gregarious Labrador-Rottweiler mix), Lippman walked me through hundreds of plants, coddled by 80-degree daytime temperatures and 40 to 60 percent humidity, and goaded into 14 hours of daily photosynthetic labor by high-pressure sodium lights overhead. Some were seedlings that had barely unfurled their first embryonic leaves; others had just begun to flash their telltale yellow flowers, harbingers of the fruit to come; still others were just about ripe, beginning to sag with the weight of maturing red fruit.

Photographs by Dolly Faibyshev

What makes this greenhouse different—what makes it arguably an epicenter of a revolution in plant biology that may forever change not just the future of the tomato but the future of many crops—is that 90 percent of the tomato plants in the building had been genetically altered using the wizardly new gene-editing tool known as Crispr/Cas-9. Lippman and Joyce Van Eck, his longtime collaborator at the Boyce Thompson Institute in Ithaca, New York, are part of a small army of researchers using gene editing to turn the tomato into the laboratory mouse of plant science. In this greenhouse, Crispr is a verb, every plant is an experiment, and *mutant* isn't a dirty word.

Lippman walked to the rear of the building and pointed out a variety of tomato known as Large Fruited Fresh Market—one of the commercial varieties that turn up in supermarkets, not farmer's markets. This particular plant, about two months old, bowed with big, nearly ripe fruit. It was, Lippman explained, a mutant called "jointless." Most tomato varieties have a swollen knuckle of tissue (or joint) on the stem, just above where the fruit forms; when the tomato is ready, it tells itself, as Lippman put it, "OK, I'm ripe—time to fall," and the cells in

PHOTOGRAPHS BY DOLLY FAIBYSHEV/REDUX

the joint receive a signal to die, letting go of the tomato. That is nature's way of spreading tomato seeds, but the joint has been a thorny problem for agricultural production, because it leaves a residual stem that pokes holes in mechanically harvested fruit. Jointless tomatoes, whose stems can be plucked clean, have been bred and grown commercially, but often with unwanted side effects; these gene-edited versions avoid the unintended consequences of traditional breeding. "We can now use Crispr to go in and directly target that gene for the molecular scissors to cut, which leads to a mutation," Lippman said. "Voilà: the jointless trait in any variety you want."

We moved on to several examples of *Physalis pruinosa*, a relative of the tomatillo that produces a small, succulent fruit called a ground cherry. The plant has never been domesticated, and Lippman referred to the wild version as a "monstrosity": tall, unkempt, and stingy, bestowing a single measly fruit per shoot. Next to it stood a *Physalis* plant after scientists had induced a mutation called "self-pruning." It was half as tall, much less bushy, and boasted half a dozen fruits per shoot. Lippman plucked a ground cherry off one of the mutated plants and offered it to me.

"Smell it first," he entreated. "Enjoy the smell." It was exotic and faintly tropical. I popped it in my mouth and bit into a complex burst of flavor. Like all its cousin tomatoes, the taste was a mystical, time-lapse blur of sugar and acidity, embellished by the whiff of volatile compounds that found my nose and rounded out the flavor.

"You just ate an edited plant," Lippman said with a smile. "But don't be too nervous."

Like the majority of scientists, Lippman regards genetically modified plants as safe to eat. But his mischievous smile acknowledged that not everyone views the technology as innocuous. There is a lot of nervousness about genetic tinkering with food plants. Genetically modified (GM) "transgenic" crops such as corn and soybeans have infiltrated processed foods, animal feed, and biofuels for many years, and the battle over them has long divided the public in the US and overseas. The Crispr revolution is reinventing, if not reigniting, that debate. Most of the plants that have been gene-edited to date have been created by knocking out genes (that is, mutating them), not by introducing genes from unrelated species, as first-generation genetic modification generally did—rousing cries of "Frankenfoods" and fears of environmental contamination. Precisely because it's subtraction rather than addition, scientists argue that this form of gene editing mimics the process of agriculturally induced mutations that characterizes traditional plant breeding. This distinction may not assuage critics, but it has apparently persuaded federal regulators; gene-edited soybean and potato crops are already in the ground, and last March the US Department of Agriculture declared that crops developed with gene-edited mutations are "indistinguishable" from those produced by traditional breeding and "do not require regulatory oversight."

Zach Lippman in a Cold Spring Harbor test field of tomato plants edited to produce more fruit. Above, a gene-edited tomato plant.

STEPHEN S. HALL *is the author of six books and teaches science writing at New York University.*

Tomatoes are coddled and goaded into photosynthetic labor in a greenhouse at the Boyce Thompson Institute.

Huge questions vex the future of food—how to feed 9 billion mouths, how to farm in an era of unprecedented climate uncertainty, how to create more resilient and nutritious foods for a public wary of the new technology. Plant scientists are already using Crispr and related technologies to reshape food crops in dramatic ways—editing wheat to reduce gluten, editing soybeans to produce a healthier oil, editing corn to produce higher yields, editing potatoes to store better (and not throw off a carcinogen when cooked). In both industrial and academic labs, new editing tools are being developed that will have a profound impact on the foods all of us eat. Yet this newfound power to transform food traits coincides with a moment when the agriculture business has consolidated into essentially three mega-conglomerates. Those companies have the money to put this new technology to use. The question is: What use will they put it toward?

Soybeans, potatoes, and corn melt invisibly into the food chain, but tomatoes add a big red exclamation point to the current debate. Perhaps no food crop is more emblematic of what is at stake—agriculturally, biologically, culturally, and perhaps even in homegrown foodie ways—than the tomato: queen of the farmer's market, jewel of the backyard garden, alpha vegetable of locavores everywhere. Lippman's greenhouse reveals just some of the ways gene editing is already altering the tomato—he has plants that flower earlier, that are oblivious to daylight cues, that prune themselves into smaller footprints, that can be genetically programmed to space out the position of fruits on the stem like an accordion.

For people who love to eat or grow tomatoes (I do both), the arrival of Crispr provokes both cynicism and giddy hope about the future of our favorite vegetable. Cynicism because most of the practical scientific efforts would perpetuate the dreary taste of commercially produced

tomatoes. In one sense, this is simply the latest in a century-long conquest of the produce aisles by the desires of food growers, who prize greater yield at lesser cost, over the desires of consumers, who cherish taste and nutrition. (Harry Klee, a tomato expert at the University of Florida, says that the perfect tomato for industry is one that exactly matches the size of a McDonald's hamburger.) Hope because there is something intriguing about using new technology to preserve the ravishing, sweet acidic burst of an heirloom tomato in a hardier, disease-resistant plant—an heirloom-plus, if you will.

After Lippman walked me through his garden of man-made mutations, I couldn't resist asking if the heirlooms I struggle to grow every year might also benefit from Crispr's scissors.

"We're not doing any editing of heirlooms," Lippman said. "Not yet. But it's in the works. They could benefit from a little bit of tweaking."

A

This is a story about tomatoes, of course. But it is also, like all agricultural stories, about mutations—"natural" mutations and man-made mutations, invisibly insidious mutations and overtly grotesque mutations, mutations that were created earlier this year at Cold Spring Harbor Laboratory and mutations that may have occurred 10,000 years ago, like the ones that transformed *Solanum pimpinellifolium* from a scraggly perennial weed producing pea-sized fruit along the Pacific coastal margins of Peru and Ecuador to those beautiful big-lobed heirlooms in your backyard. Our cultural thesaurus has reduced the word *mutant* to a term of derision, but if you think *mutation* is a dirty word you should probably stop reading—and probably stop eating plant-based food too. The foundational principle of plant breeding is to take advantage of genetic modification, whether the mutation is caused by sunlight or x-rays or Crispr. As Klee puts it, "there isn't a single crop that I know of in your produce aisle that is not *drastically* modified from what is out there in the wild."

Every backyard gardener is a connoisseur, witting or otherwise, of mutation. The intense, thin-skinned freshness of Brandywines, the apricot glow of Jaune Flamme, the green standoffish shoulders of Black Krims, and my personal favorite, Rose de Berne, with its blush of color and amazing taste—all those heirlooms are the product of long-ago, hand-me-down mutations.

Every spring, almost inevitably during March Madness (this year, during Villanova-Michigan), I get down on the floor with a bunch of peat pots and starter soil and clumsily press seeds of all of the above varieties into virgin dirt. My wife wonders why I can't buy seedlings at the market like everyone else, but I've never outgrown the childlike thrill of watching an itty-bitty snippet of plant DNA, encased in the stiff callus of a seed coat, unfurl into a 5-foot-tall plant that yields its sublime bounty. Gardeners—the original DIY biologists—all know this thrill. And so does Lippman. That's how he got into gene-editing tomatoes in the first place.

Lippman grew up in Milford, Connecticut; his father was an English teacher and his mother worked in health care. Among his earliest memories is visiting a nearby farm with his father when he was 6 or 7 years old and picking up leftover Halloween pumpkins and gourds—with their mind-blowing shapes and colors—that littered the field.

That pumpkin field was part of Robert Treat Farm, and when he was 13, Lippman began working summers there, cultivating his fascination with plants. By the time he graduated from high school in 1996, he had decided to pursue plant breeding and genetics, first at Cornell University and then at Cold Spring Harbor, where he got his PhD and is now a Howard Hughes Medical Institute investigator.

IF YOU THINK MUTATION IS A DIRTY WORD YOU SHOULD PROBABLY STOP READING. AND PROBABLY STOP EATING PLANT-BASED FOOD TOO.

Lippman's office is a shrine to the tomato: On his walls are old tomato-can labels and antique postcards of implausibly gigantic tomatoes, and thousands of little brown envelopes containing seeds, each marked by year and variety, are stacked on his desk, in old seed boxes, in wooden trays and plastic cabinets against the wall. The most telling relic is just behind the door: a large framed reproduction from a 16th-century book by Pietro Andrea Mattioli, believed to be the earliest color depiction of the tomato following the Spanish conquest of the Americas. To a geneticist like Lippman, the Mattioli print is especially significant because it is early evidence that pre-Columbian cultures knew a beneficial tomato mutation when they saw one—they had already converted the nubbin of wild fruit into a large, multiple-lobed golden beefsteak.

Up until the 1930s, agricultural scientists essentially relied on the same techniques as the original tomato farmers in Central America: Be patient enough to wait for nature to produce a useful mutation, be smart enough to recognize that desirable trait (bigger fruit, for example), and be clever enough to create a new variety with that trait by selecting the mutant strains and propagating them. Put another way, agriculture has always been about *unnatural* selection—human choice privileging certain mutations while discarding others. Biol-

ogists sped up this process around the time of World War II by deliberately inducing random mutations in seeds with the use of chemicals, x-rays, and other forms of radiation. But even so, the process was slow. Selective breeding of a desirable trait could easily take a decade.

This all began to change in 2012, an annus mirabilis for the tomato. In May of that year, plant geneticists completed the Tomato Genome Project—the entire DNA sequence of the tomato plant, all 900 million base pairs on 12 chromosomes. Then, in June, a group led by Jennifer Doudna at UC Berkeley published the first report on the new gene-editing technique known as Crispr, followed soon after by a group at the Broad Institute of MIT and Harvard. The fruit of those two converging streams of research—and, yes, botanically speaking, tomato *is* a fruit—was a race among scientists to see if the new technique worked in plants.

As soon as word of Crispr broke, Lippman wondered, "Can we do it in tomato? And if we can, let's move." Moving fast meant doing an experiment on a tomato gene that would prove the efficacy of Crispr without too much delay. Which gene did Lippman and Van Eck target? Not one that would improve the size or shape of the fruit—that would take too long, and Van Eck was impatient. "I don't want to have to put it in the greenhouse and wait for it to grow," she told Lippman. "I want to be able to see something in the petri plate." So they picked a gene that was of zero economic significance and less-than-zero consumer appeal. It was a weird gene that, when mutated, produced disfigured tomato leaves that looked like needles. The mutant version was called "wiry."

Seeds are stored in boxes, top, and then planted. Below, a research field at Cold Spring Harbor with some 8,000 gene-edited plants.

The wiry mutation was so obscure that Van Eck had to dig up a paper from 1928 that described it for the first time to know what she'd be looking for. Each Crispr-directed mutation requires a customized, genetically engineered tool called a "construct"—a so-called guide RNA to target the right tomato gene and an enzyme riding shotgun to cut the plant DNA at precisely that spot. In this case, Lippman designed the construct to target the wiry gene and cut it; the mutation is not created by Crispr per se but by the plant when it attempts to repair the wound. Van Eck used a bacterium that is very good at infecting plants to carry the Crispr mutation tool inside tomato cells. Once mutated, these cells were spread onto petri plates where they began to develop into plants. Van Eck still had to wait about two months before the tomato cells developed into seedlings and sprouted leaves, but it was worth the wait.

"I still remember when I saw the first leaves coming up," she recalls. The leaves were "radialized"—curled up into needlelike shapes. "Omigod, it worked!" she cried, and raced down the hallways of the institute to tell anyone who would listen. "I was thrilled because, you know, when does something work the first time?"

Not only had they demonstrated that Crispr could produce a heritable trait change in a fruit crop, they also had their answer in two months rather than a year. They knew that the same basic process could theoretically be used to edit, with exquisite precision and unprecedented speed, *any* gene in *any* food crop.

As soon as they knew it worked, Lippman and Van Eck began Crispring every trait they'd wanted to study for the past 15 years. One of them was jointless. For 60 years, researchers had been trying to solve the problem of the joint on the tomato plant's stem. Large-scale farming of tomatoes—California alone produces more than 10 million tons each year—requires mechanical harvesting, and those stabbing stems of jointed tomatoes make

the task harder and more wasteful. Lippman, who studies plant architecture, knew that many jointless tomato plants produce excessive branching and lower yields. He discovered that this unintended consequence was the result of traditional breeding: When breeders favored the jointless mutation, they unwittingly produced unwanted branching as well because of a complex interaction between jointless and another ancient mutation. Traditional breeding produced another side effect—abnormally shaped tomatoes—because the process of selecting the jointless trait dragged along a chunk of DNA with an unwanted mutation. (This phenomenon is known as linkage drag.)

If Lippman could Crispr his way to the jointless mutation without dragging along the deleterious effects related to traditional breeding, it would offer a significant advance for growers. He and Van Eck had to wait longer than they had for the needle-nosed leaves of wiry, but by March 2016, Lippman had jointless tomatoes growing in his greenhouse. They published the work in the journal *Cell* in the spring of 2017, and Lippman shared the gene-editing tool with Klee at the University of Florida. Last March, Klee and his team planted a plot of gene-edited jointless mutants, in a commercial variety called Florida 8059, in a test field north of Gainesville.

Quick reality check: Despite the hype about the gene-editing revolution, the past couple of years have revealed limitations as well as successes. Scientists will tell you Crispr is great at "knocking out" a gene. But using it to insert a new gene and, as many popular accounts suggest, "rewrite" the germline of man, beast, or plant? Not so easy. "Crispr is not the be-all and end-all," says Dan Voytas of the University of Minnesota, one of the pioneers of agricultural gene editing. Moreover, genomes are complex, even in plants. Just as a dozen knobs on a stereo console can shape the overall sound of a single song, multiple genetic elements can control the effect of a single gene.

That daunting complexity inspired Lippman's lab to pursue a clever riff on gene editing. "I remember having a sticky note here," Lippman says, pointing to his keyboard. The note simply read: "Promoter CRISPR."

In plants as well as animals (and humans), there is part of the DNA that lies outside the protein-encoding segment of the gene and essentially regulates its output. This upstream patch of regulatory DNA is called the promoter, and it sets different levels of output—volume, if you will—for specific genes, from a little to a lot. What if, Lippman's group asked, you could use Crispr to, in effect, adjust the volume of a particular gene, turning it up or down like a stereo knob, by mutating the promoter in different places?

The Long Island greenhouse is now full of examples of what happens. As they reported in *Cell* last October, Daniel Rodríguez-Leal and colleagues in Lippman's lab showed that, by mutating the promoter of the self-pruning gene in different places, they could adjust its output like a dimmer switch, producing subtle but important changes. By using Crispr to create varying doses of a gene, Lippman says, scientists can now find "better" versions of plants than nature ever provided.

But better for whom? One of Lippman's pet phrases is "sweet spot"—that point of genetic balance where desirable traits for agriculture can be improved without sacrificing essential features like flavor or shape. "Now we can start to think about taking some of our best tomato varieties, and if they can flower faster, you can start to grow them in more northern latitudes, where the summers are shorter," he says. "We can begin to imagine new crops, or new versions of existing crops, for urban agriculture, like tiered cropping that they have in these abandoned warehouses ... Adapt the plant so that it's more compact, flowers faster, gives you a nice-sized fruit with a decent yield, in a very compressed growth setting, with the equivalent of protective agriculture—greenhouse conditions—but with LED lights." Because every plant gene comes with its own promoter, this genetic "tuning," as Lippman puts it, could apply to virtually any vegetable crop.

"THE SAD REALITY IS THAT INDUSTRY IS NOT REALLY COMMITTED TO MAKING A BETTER-TASTING TOMATO."

Tuning is just one of many ways biologists are remaking the tomato. Last year, researchers at the Sainsbury Laboratory in England gene-edited a tomato variety called Moneymaker to be resistant to powdery mildew, and a Japanese research group recently created tomatoes without seeds. On the day in May that I set my first heirloom seedlings into the ground, I happened to have a Skype conversation with two plant biologists in Brazil who have taken the gene editing of tomatoes to a whole new level. In collaboration with the Voytas lab at the University of Minnesota, Agustin Zsögön of the University of Viçosa and Lázaro Peres of the University of São Paulo claim to have, in essence, reverse-engineered the weedlike wild tomato believed to be the forerunner of all cultivated varieties. (They haven't published this work to date, but have discussed it at meetings.) Rather than tweak a domesticated variety of tomato, they went back to square one—the wild plant—and used Crispr to knock out a

5 MOMENTOUS MUTATIONS

The domesticated tomato possesses thousands, perhaps millions, of spontaneous mutations that helped turn a forlorn, ground-hugging weed into the most popular American garden plant, not to mention ubiquitous ingredient in our cuisine. Now scientists are using gene-editing techniques to create these mutations and optimize the plants.

1

self-pruning
Discovered in a Florida tomato field in 1914, this mutation affects the plant's size, shape, and compactness. This variation alone can change the wild, prawling shrub into the orderly, compact crop familiar to gardeners.

2

self-pruning 5g
This affects the tomato's day-length sensitivity apparatus, allowing it to be grown during shorter summers at northern latitudes.

3

fasciated
Wild tomatoes possess only two tiny seed chambers; this mutation, dating to the pre-Columbian era, allows tomato plants to develop more seed chambers and thus increases the size of the fruit.

4

jointless-2
Originally reported in a wild tomato species from the Galapagos Islands in 1956, this mutation eliminates a break point in the middle of the stem, just above the fruit, facilitating mechanical harvesting.

5

lycopene beta-cyclase
The tomato gets its red color from an antioxidant chemical called lycopene. This mutation increases the fruit's lycopene content by blocking the plant from metabolizing lycopene into byproducts.

handful of genes all at once. The result? Where the wild plant was sprawling and weedy, the gene-edited tomato was compact and bushy; where the ancestral plant had pea-sized fruit, the gene-edited version had reasonably plump, cherry-sized tomatoes. The edited fruit also contained more lycopene, an important antioxidant, than any other known variety of tomato. The process is called "*de novo* domestication."

"We didn't go from pea-sized to beefsteak, but we went from pea-sized to cherry-sized," said Zsögön of this first attempt. And how did the tomatoes taste? "They taste great!" Peres insisted. In a similar vein, Lippman and Van Eck are domesticating the wild ground cherry in the hope that it can join blueberries and strawberries as one of the basic berry crops.

What makes the de novo approach so intriguing is that it takes advantage of all the accumulated botanical "wisdom" of a wild plant. Over tens of thousands of years of evolution, a wild species acquires traits of hardiness and resilience, such as resistance to disease and stress. Domestication eliminated some of those traits. Since those resistance traits typically involve a suite of genes, Peres says, they would be extremely difficult to introduce into domesticated tomatoes, via Crispr or any other technology. And the approach can exploit other extreme traits. Peres wants to "domesticate" a wild species from the Galapagos, which can tolerate extreme environmental conditions such as high salinity and drought—traits that might enhance food security in a future with enormous climate fluctuations.

Rising temperatures. Changing growing seasons. A rising global population. The environmental toll of herbicide overuse. What if gene editing, for example, could favor disease-resistance genes that would reduce pesticide use? Lippman asks. "That's not just feeding the world, that's protecting the planet."

A

All this new plant science—knocking out genes, fiddling with the volume knob of promoters, de novo domestication—is wonderfully creative and happening very fast. But sooner or later, the other shoe drops in the conversation. Will consumers want to eat these tomatoes? Are Crispr vegetables and grains simply "new GMOs," as a number of environmental groups maintain, or are gene-edited plants intrinsically different? "This is the beginning of the new conversation," Lippman says.

The old conversation was acrimonious and emotional. The initial GM foods that Monsanto introduced in the 1990s were "transgenic," meaning that biologists used genetic engineering to introduce foreign DNA, from an unrelated species, into the plant. Gene editing is much more analogous to older forms of mutagenesis such as irradiation and

Joyce Van Eck saw curled leaves on a tiny tomato plant growing on a petri plate and knew that the Crispr experiment was a success.

chemicals, though much less scattershot. Rather than creating random mutations, Crispr targets specific genes. (Editing that misses its mark is possible, though Lippman hasn't detected any in his work.) That is why plant scientists have been so eager to use it, and why the USDA regards gene-edited knockouts as similar to earlier mutagens and thus not requiring special regulation. (In the case of "knocking in," or adding, a gene to crop plants, the USDA has indicated it will assess on a case-by-case basis.) Some European countries have banned GMOs, and the European Union has yet to issue a final judgment on gene-edited plants.

Although multiple studies have failed to show that GMOs pose a threat to human health, public doubts persist—a Pew Research Center survey in 2016 indicated that 39 percent of Americans believe that genetically modified foods are less healthy than non-GMOs, and in his household, Lippman admits, his wife initially preferred not to eat his gene-edited tomatoes.

There are other reasons that genetically altered foods continue to arouse suspicion. Monsanto's early GMO effort used a revolutionary technology not to make healthier or more environmentally sustainable foods but to confer resistance in soybean and corn to the company's proprietary herbicide, Roundup. The company's aggressive promotion of such a self-serving first product was considered a public relations disaster.

Big agribusinesses are now positioning themselves to take advantage of gene editing. A recent rash of mergers has created three giant multinationals in global agriculture: Bayer (which completed its acquisition of Monsanto this year), DowDuPont (following Dupont's earlier merger with Dow Chemical), and Syngenta (which was acquired last year by the huge Chinese gene-editing company ChemChina). The intellectual property issues are possibly more complex than plant genetics. Both the Broad Institute and DuPont Pioneer hold basic Crispr patents that apply to agriculture, and the two entities teamed up last fall to jointly negotiate licenses for farming applications (all three giant agribusinesses have licensed the technology). According to agricultural sources, the right to use Crispr for commercial agriculture requires an upfront fee, annual royalty payments on sales, and other conditions. (The Broad Institute did not discuss licensing terms, except to say that it is not involved in product development.)

This is where gene editing bumps up against the harsh economics of agriculture. Academic scientists can conduct

Lippman, outside a tomato greenhouse: "I've eaten many gene-edited tomatoes, yeah."

basic research with Crispr without paying a licensing fee. But that's as far as it goes. "I can't develop products and start to sell them," Lippman says. Commercial development requires payment of a licensing fee—a cost more easily borne by deep-pocketed agricultural companies.

There are some smaller biotechs seeking to maneuver around the giant companies and the intellectual property obstacles. Calyxt, a Minnesota-based firm cofounded by Voytas, has already received USDA approval to grow several crops using an earlier and more-difficult-to-use gene-editing technology known as TALENs. Lippman consults for a Massachusetts startup called Inari. Benson Hill Biosystems, based in St. Louis, has been working on improving plant productivity using a patented set of new gene-editing scissors the company calls Crispr 3.0. But CEO Matthew Crisp (yes, that's his name) claims innovation is being stifled by an intellectual property landscape that is "very murky." Benson Hill's partners and prospective licensees, he says, have complained that commercial rights to Crispr gene-editing technology are "too expensive, too cumbersome, or too uncertain." The discovery of new gene-editing enzymes and other innovations may complicate the patent landscape even more. As one source put it, "It's a mess. And it's only going to get worse."

That's why there's a lot of attention focused on a new startup called Pairwise Plants, in which Monsanto has teamed up with several Crispr pioneers from the Broad Institute. Recent statements to Bloomberg by company CEO Tom Adams, a former vice president of Monsanto, stressing new crops that are "really beneficial to people," raised some eyebrows. "You know, it's not Monsanto language," Voytas noted. And the Monsanto pedigree has some plant biologists concerned. "The question will be: They have enormous baggage in terms of consumer acceptance," Lippman says. "And if they botch it, they're going to ruin it for everybody else. Everyone is sort of holding their breath."

Here's a simpler question: What about flavor? When I asked Harry Klee if he had tasted any of the jointless 8059 tomatoes he's growing, he laughed and said he hadn't bothered. "We know that Florida 8059 by itself doesn't really have too much taste to begin with." A better-tasting tomato always plays second fiddle to market economics. The majority of tomatoes grown in Florida, for example, go to the food service industry—"to the McDonald's and Subways," Klee says. "The sad reality," Klee says, "is that industry is not really committed to making a better-tasting tomato." Klee loves to talk about taste—he heads a group that identified about two dozen genetic regions related to exceptional tomato flavor. "We know exactly how to give you a sweeter tomato that will

taste better," he says. But those tomatoes are not as economically attractive to producers. "The growers won't accept it."

What about consumers? Would they accept a gene-edited tomato if it tasted better? Or, to put it in a slightly more idiosyncratic way, would it be botanical blasphemy to gene-edit an heirloom?

In his tour of the greenhouse, Lippman paused at one point to express good-natured scorn for heirlooms. They are terrific tomatoes, he admits, but "pretty crappy producers." From personal experience, I can confirm that heirlooms are finicky plants and stingy producers, with lousy immune systems—most of all, they're heartbreakers, at least in the backyard. They start out like Usain Bolt in the 100 meters and end up looking spent, shriveled, hobbled by all manner of wilts and fungi and pests, leaves drooping like brown funereal crepe. It was tempting to think of using the new genetic tools to improve them. Klee is "very anxious to introduce gene editing into the home garden." He thinks gardeners like me might be the place to make the argument that gene-edited tomatoes are not GMOs.

"What if I could give you a Brandywine that had high lycopene, longer shelf life, and was a more compact plant?" Klee asked me. "I could do all of those today, with knocking out genes and genome editing. And I could give you something that was virtually identical to Brandywine that was half as tall and had fruit that didn't soften in less than a day, and were deep, deep red with high lycopene. I mean, would you grow that?"

"Absolutely!" I told him.

"I think most people would grow that," he replied. "I think this could be a huge opportunity to educate home gardeners in what plant breeding is all about."

Not everyone would agree with Klee (or me). Voytas, a pioneer of gene editing in plants, chuckled when I asked him about a gene-edited heirloom. "You know, part of it is, they're *heirloom*," he said. "The name inherently suggests this is something of value from the past. Not something new and techy." More to the point, he reminded me of the "sort of outrageous" licensing fees for the gene-editing technology. "So your heirloom tomato idea would never be financially lucrative enough to pay the requisite licensing fees."

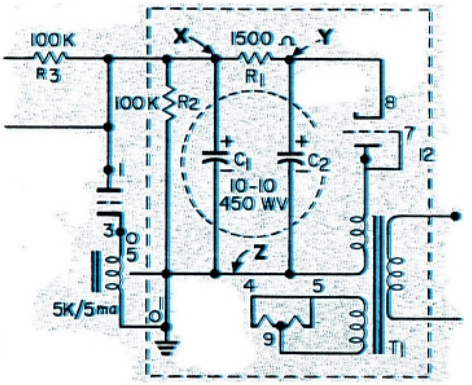
The bottom line: Gene-edited tomatoes are probably on their way to the market. But tomatoes with better flavor? Probably not going to happen anytime soon.

Trays for germinating tomato seeds, top, and *Physalis pruinosa* plants, both at the Boyce Thompson Institute in Ithaca.

In early June, Zach Lippman went back to being a farmer. On what initially seemed like a sunny day, he and a dozen coworkers got their hands dirty transplanting some 8,000 gene-edited tomato plants into an outdoor field on the grounds of Cold Spring Harbor Laboratory. There were lots of the familiar mutants—jointless, self-pruning, daylight insensitivity. (The outdoor planting required prior approval from the USDA.) "Plant 'em deep!" he cried, as the crew raced to get the tomato seedlings in the ground under suddenly darkening skies.

The ultimate fate of the gene-edited tomato is as unpredictable as the weather, but the fate of these particular tomatoes is less of a mystery. Lippman often takes them home. "I've eaten many gene-edited tomatoes, yeah," he laughs. (Not surprisingly, he finds "absolutely nothing" different about them.) "They're not GMO," he insists. "It's just that you're left with what would be equivalent to a natural mutation. So why not eat it? It's one of just thousands or millions of mutations that may or may not affect the health of the plant ... and we're still eating them!"

The Political Education



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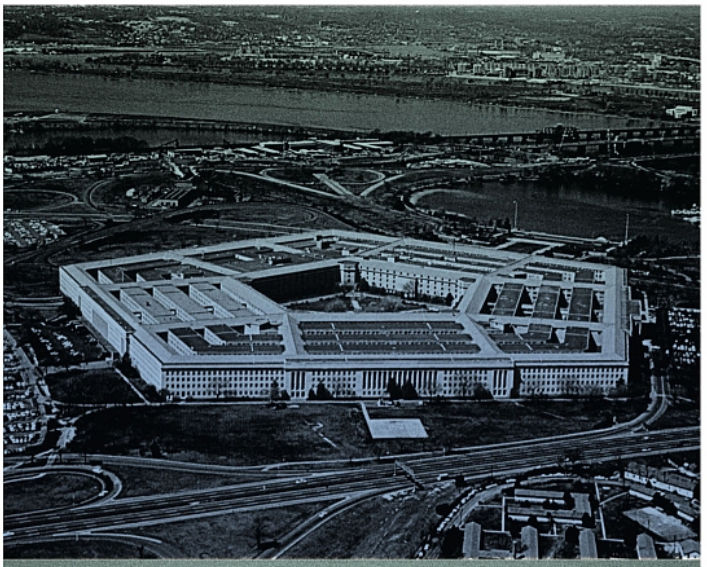
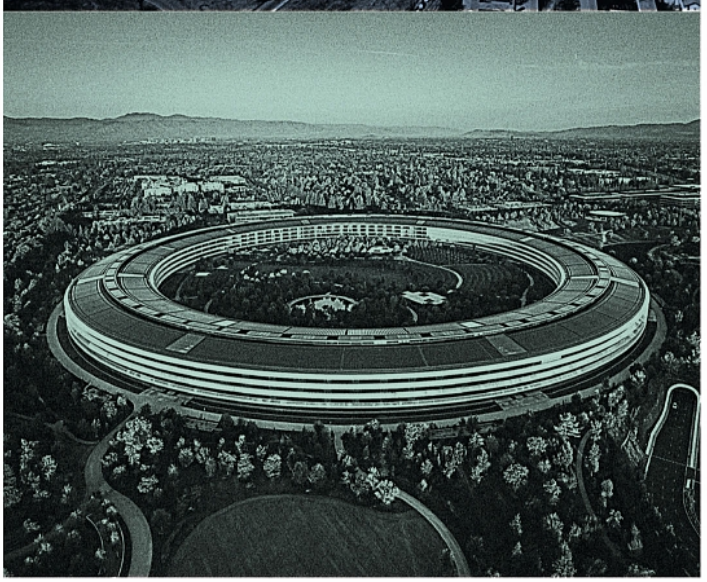




# of Silicon Valley

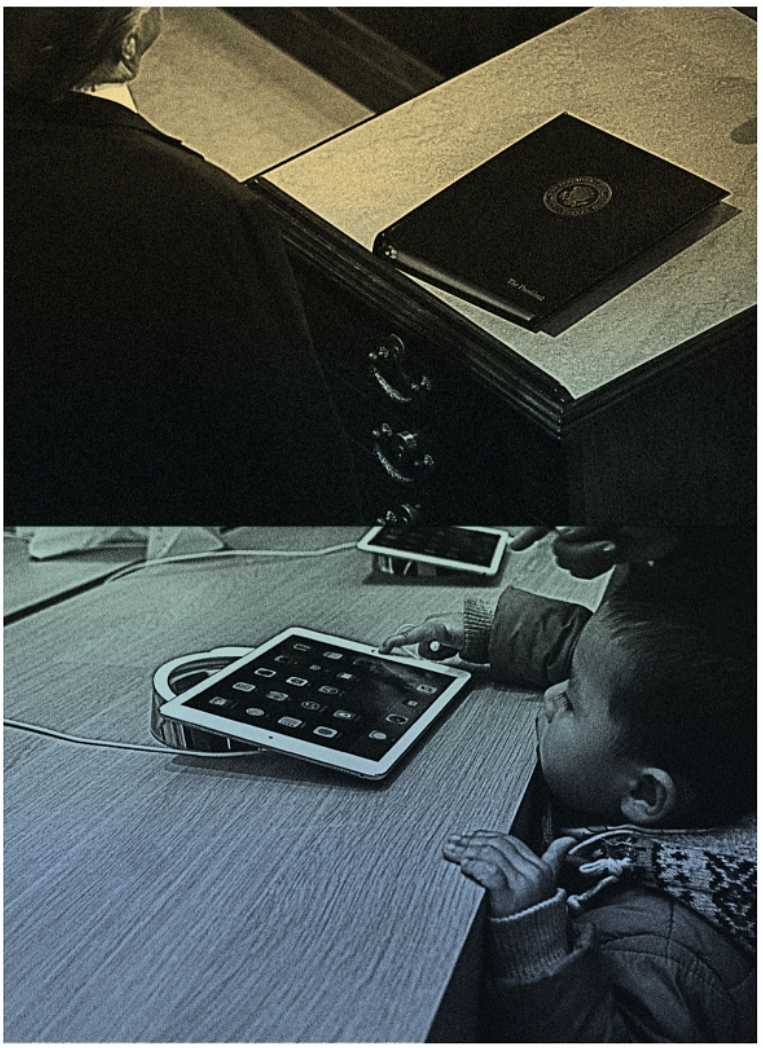
by Steven Johnson

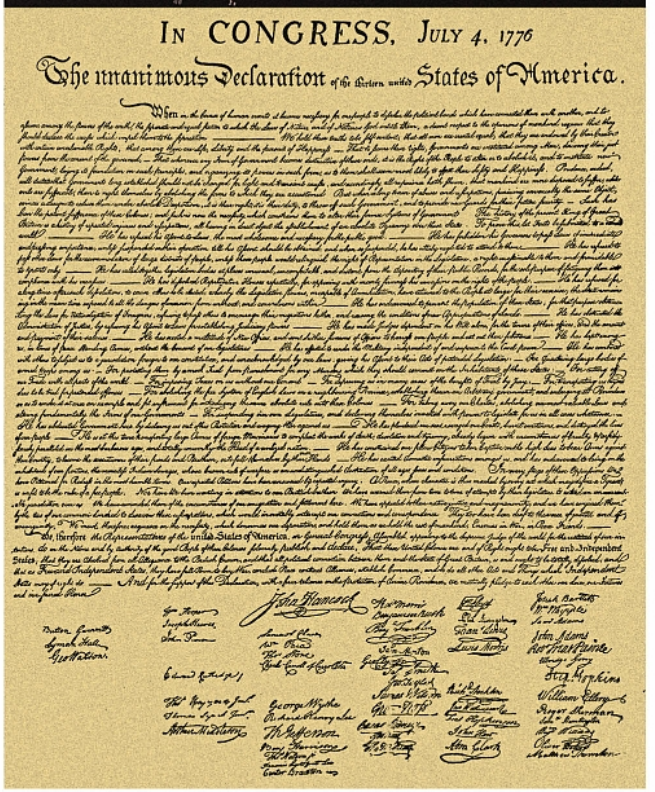
How did we get from John Perry Barlow's anti-government techno-libertarianism to Ro Khanna's pro-government vision of redistributed wealth?

"Confusion reigns in the political arena. Old labels no longer fit, and the citizenry seems torn between competing desires for saviors and scapegoats." So began a 1995 story in WIRED on the state of digital-age politics. Electoral turmoil then amounted to a standoff between "a Democratic president, a Republican Congress, and a slew of voters registering as 'Independent.'" More innocent times, clearly. Still, the public seemed to be looking for new paradigms, which inspired WIRED to ask, "Is there a new politics emerging in the Net/cyberspace/digital culture?" The answer was, cautiously, yes. And that politics was libertarianism, with its zeal for laissez-faire capitalism and contempt for the ponderous institutions of Big Government.

If you asked a similar question today—is there a new Silicon Valley politics?— it would be pretty clear that libertarianism is no longer the answer. Sure, obstreperous free-market utopians are still some of the most quotable members of the tech scene, but truly, the last right-leaning presidential candidate to win Santa Clara County, the heart of Silicon Valley, was Ronald Reagan in 1984. As the tech industry has grown in power and influence, its politics have moved to the left. Bill Clinton pulled out wins in both his campaigns. In 2012, Barack Obama won with 70 percent of the vote to Mitt Romney's 27 percent, and employees of big tech companies like Apple and Google donated overwhelmingly to Obama's campaign. Four years later, Bernie Sanders got 42 percent of the Democratic primary vote, and Hillary Clinton won 73 percent of the general electorate in Santa Clara County, one of the most lopsided results in California. Libertarian candidate Gary Johnson? He received 3.64 percent of the vote, close to his national average.

Today many people working inside Silicon Valley, and many on the right who vilify it from a distance, consider the community to be "an extremely left-leaning place," as Mark Zuckerberg recently put it in congressional testimony. When people want to understand Silicon Valley's political leanings, they often look to California's 17th Congressional District. Apple and Intel are headquartered there, as is Tesla's manufacturing plant. In 2016, the voters of the





Ro Khanna won with big tech money—and is now drafting an Internet Bill ofRights.

17th elected Ro Khanna, a former deputy assistant secretary in Obama's Commerce Department, to represent them. Based on his 2017 legislative record, GovTrack ranked Khanna the 14th-most-liberal representative in the House.

Khanna is running for reelection this year, and one Saturday afternoon in June, he arrived at Mission San Jose High School in Fremont for a town hall meeting. Standing at the podium wearing a dark suit and tie, he was sharp, funny, and in command of the room. For a time, Khanna was a visiting economics lecturer at Stanford University, and the general impression he gives onstage is of a garrulous professor entertaining his undergraduates.

During the 90-minute session, he delivered statements that would slot perfectly into the Sanders wing of the Democratic Party. He began with a homily on the importance of stricter gun control. He spoke up for Medicare for all and railed against the 2017 Republican tax cut, saying he would have preferred to eliminate all student debt. The son of first-generation Indian immigrants, he also made a case for the importance of immigration and diversity in driving innovation. "I went to West Virginia," he told the crowd, "and they started out by asking me, 'What do we need to do to get more tech here,' and I said, 'You need a few more Indian restaurants.'" (Khanna knows his audience: His district is more than 50 percent Asian, many of South Asian ancestry.) Almost everything he advocated involved expanding the state apparatus, not starving it, as libertarians would presumably want to do.

But when you investigate the actual values held by the tech sector, the narrative of tech's steady leftward march gets much more complicated—and intriguing. A widely discussed 2017 study conducted by Stanford political economists David Broockman and Neil Malhotra, collaborating with technology journalist Greg Ferenstein, surveyed the political values of more than 600 tech company founders and CEOs—the elite of the tech elite. The top-line finding was, unsurprising by now, that Silicon Valley is not libertarian. The founders they surveyed were less likely than even *Democrats* to embrace the core expression of the libertarian worldview—that government should provide military and police protection and otherwise leave people alone to enrich themselves. They expressed overwhelming support for higher taxes on the wealthy and for universal health care. But in other ways they deviated from progressive orthodoxy. They were far more likely to emphasize the positive impact of entrepreneurial activity than progressives and had dim views of government regulation and labor unions that were closer to that of your average Republican donor than Democratic partisan.

If you plot those values on the matrix of conventional US politics, there appears to be a contradiction: The tech elite want an activist government, but they don't want the government actively restricting them. (Sixty-two percent of the tech elite told the Stanford researchers that government should not tightly regulate business but should tax the wealthy to fund social programs.) When it comes to wealth redistribution and the social safety net, they sound like North Sea progressives. When

PHOTOGRAPH BY JARED SOARES

you ask them about unions or regulations, they sound like the Koch brothers. Seen together, those are not talking points that play well with either party's agenda.

The scholars Brink Lindsey and Steven Teles argue that the tech sector has actually stumbled into attitudes that approach a more coherent ideology than it would initially appear, one they have called "liberaltarianism." Lindsey, who is vice president for policy at the Niskanen Center—a think tank that supports liberaltarian policies—describes the ideology as one animated by "the idea of a free-market welfare state, which sounds like an oxymoron to most people but sounds to us like what good 21st-century governance looks like, combining significant redistribution and social spending with go-go competitive markets."

This is the new politics bubbling up in Silicon Valley. In an age characterized by ideological "sorting," Silicon Valley's fundamental cosmopolitanism puts it all but fatally at odds with the Trumpist Republican Party; that leaves the stray liberaltarians of the tech industry to make do with a home within the Democratic coalition. Whether this ideology has traction beyond the Big Tech hub of Northern California is debatable—as is whether the current progressive backlash against the tech elite makes any such coalition far-fetched. But whatever you may think of Big Tech, it is arguably the single most influential concentration of new wealth and information networks in the history of humankind. It would be good to have an accurate read on what its politics are, and how they came to be.

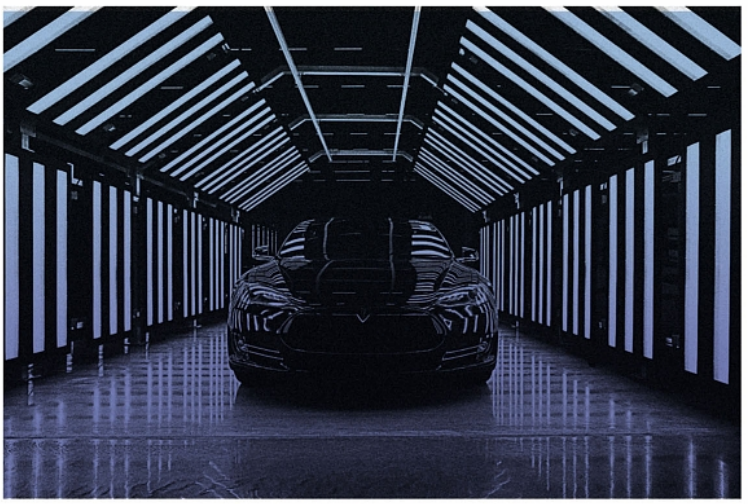
FEW PEOPLE HAVE A BETTER VANTAGE point to observe the shifting worldview of Bay Area technologists than Stewart Brand. The founder of the *Whole Earth Catalog*, Brand helped record the legendary Douglas Engelbart demo of an early graphical user interface in 1968, organized the first hacker conference in the '80s, and cofounded the Well, one of the first online communities. Brand lives on a houseboat in Sausalito, and on a typically foggy day in late spring, I met him for lunch in a nearby diner to talk about the political changes he's observed. "The people I knew in the *Whole Earth Catalog* days were libertarian, and so was I, in a sort of knee-jerk way," he says. "I bought Buckminster Fuller's line that if the world suddenly lost all of its politicians, everybody would carry on without a hiccup, but if it suddenly lost all its scientists and engineers, you wouldn't make it to Monday—and therefore, don't focus on politics, focus on real stuff." Steve Jobs called the *Whole Earth Catalog* "one of the bibles" of his generation. It fused the counterculture's interest in community with a technologist's obsession with tools that might expand human freedom and self-sufficiency. As Brand puts it, "Our line was sort of: *Ask not what your country can do for you—do it yourself! Leave the country out of it.*"

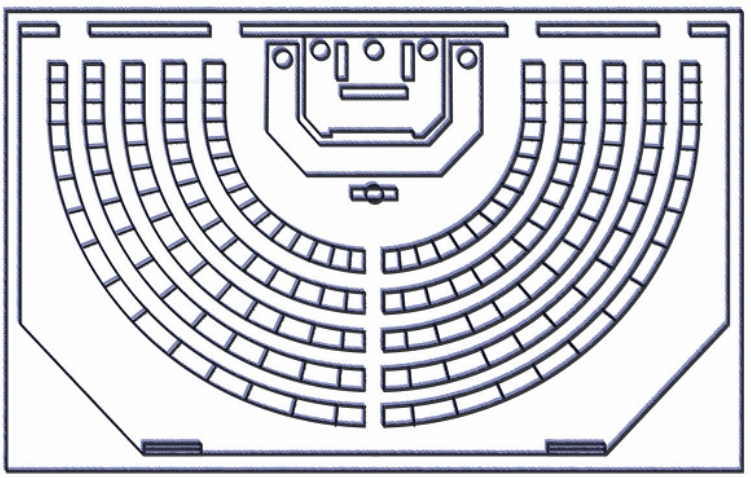
But in the mid-1970s, Brand went to work for Jerry Brown, who was then serving his first term as governor of California, and began to feel a shift in his own political philosophy. "I got acquainted with what civil service people do," Brand recalls. "They are hardworking, public-spirited—people who work together for decades and don't even know what party the other belongs to. And I realized that my libertarian friends had no idea what government does all day."

Brand realized that they had confused the "whole debased process" of electoral politics with governance, which was, in fact, something whose absence would be profoundly missed. "So I came back from working with Jerry Brown a definite post-libertarian."

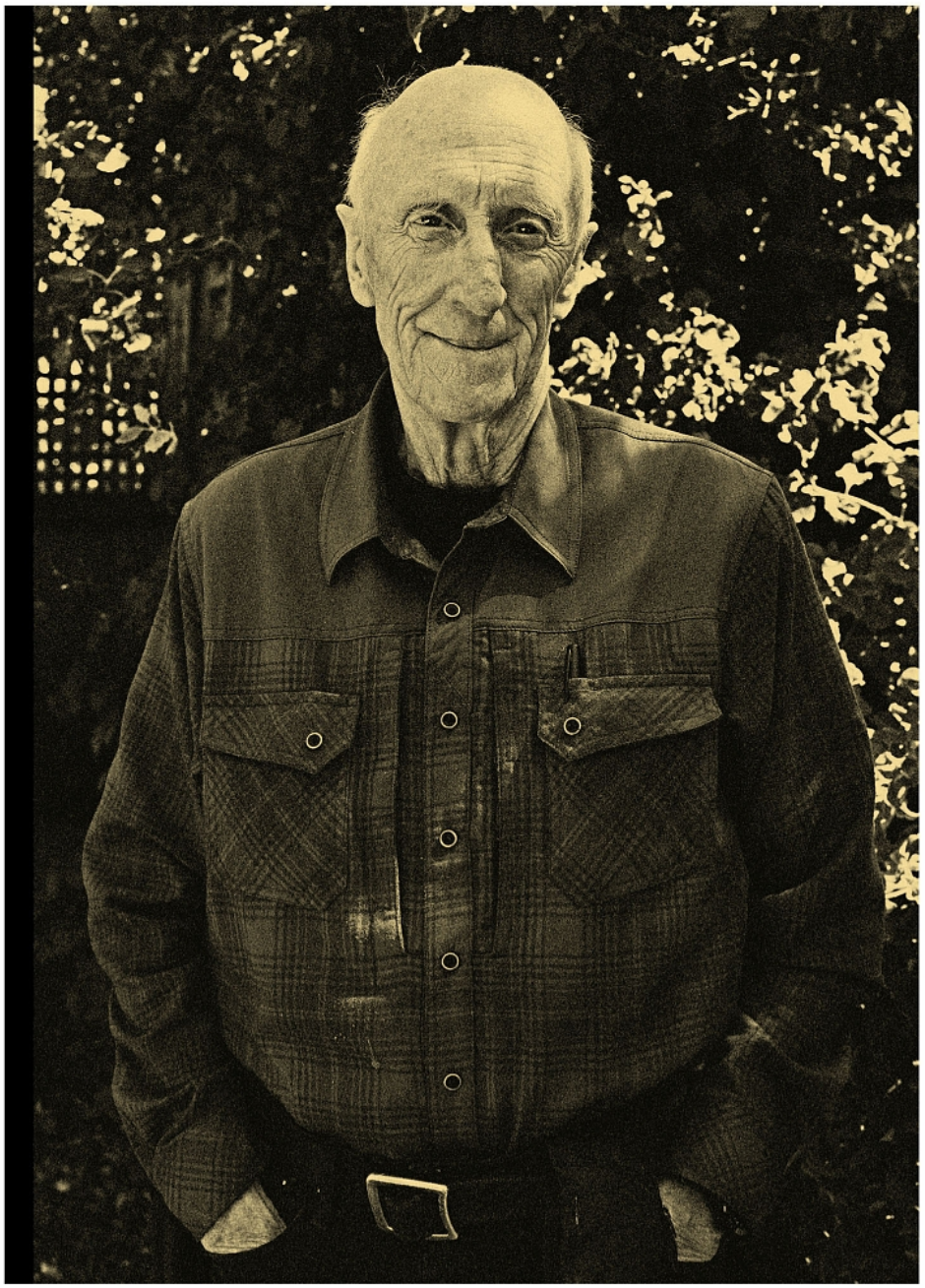
The generation of programmers coming up behind Brand hadn't yet had this revelation. "The early hackers," he says, "had grown up on Robert Heinlein, the adolescent science fiction of choice. And Heinlein was a serious libertarian." That antigovernment ethos was also fueled by the cryptographer's fear of a surveillance state. Fittingly, one of the first official advocacy groups born of the tech sector—the Electronic Frontier Foundation—focused on privacy and free-speech issues. It fought government overreach in communications but was largely agnostic about Big Government in other domains of society.

The crescendo of Silicon Valley libertarianism would come in the 1990s, with the inflation of the original internet bubble. Ideas that had been quietly percolating on bulletin boards and at hacker conferences in the Bay Area suddenly were embraced in mainstream culture. Empowered by that influence, public intellectuals from the tech sector offered up pronouncements that were genuinely antagonistic to the state, most famously John Perry Barlow's 1996 Declaration of the Independence of Cyberspace. Its bombastic opening lines now read like a parody of cyber-libertarian extremism: "Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of





CHLOE SCHEFFE (HOUSE OF REPRESENTATIVES FLOOR)



Stewart Brand rethought libertarianism when he went to work for Jerry Brown.

PHOTOGRAPH BY JESSICA INGRAM

the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather." An influential critical essay from that period defined what the authors called the "Californian Ideology," which they described as a kind of technological Manifest Destiny that inevitably leads to the deterioration of the state. "Information technologies, so the argument goes, empower the individual, enhance personal freedom, and radically reduce the power of the nation-state." WIRED amplified these anti-state pronouncements, with covers celebrating right-wing intellectuals and politicians like George Gilder and Newt Gingrich.

But even in this period of peak technoutopianism, the Valley was more apolitical than ideological. In that 1995 article, WIRED acknowledged that the digital generation had little to do with academic or party libertarianism. It was more of a folk, feral phenomenon, "a pioneer/settler philosophy of self-reliance, direct action, and small-scale decentralism translated into pixels." Visionaries like Barlow loved throwing mind grenades into mainstream culture, but tech's rank and file consisted mainly of people who, as LinkedIn cofounder Reid Hoffman puts it, "just wanted to go build something that would make a big difference in the world."

SILICON VALLEY IS STILL A PLACE WHERE people go to build and tinker with things.

And it was perhaps inevitable that, over time, those who flocked there would get interested in tinkering with government. One of the milestones in the transformation of Silicon Valley's politics came in the first year of the Obama administration, with the publication of Tim O'Reilly's short essay "Gov 2.0: It's All About the Platform." In 2004, O'Reilly had cofounded the Web 2.0 conference that laid the groundwork for the social media age. Now, his vision for a new model of governance broke decisively from the anti-statism that had defined Barlow's declaration a decade before. The tech sector shouldn't dismiss the "weary giants of flesh and steel" but, rather, should help government do a better job at delivering services. In the Valley of the techno-libertarians, a class of earnest, incrementalist liberal technocrats emerged.

Part of O'Reilly's inspiration had come from watching the success of Meetup, which provided a platform for people to connect and fix local problems. Borrowing a metaphor from public policy expert Donald Kettl, O'Reilly argued, "Too often, we think of government as a kind of vending machine. We put in our taxes, and get out services: roads, bridges, hospitals, fire brigades, police protection ... Our idea of citizen engagement has somehow been reduced to shaking the vending machine. But what Meetup teaches us is that engagement may mean lending our hands, not just our voices."

Just as open platforms like the internet had offered a venue for innovation, so could the government if it opened its information channels to outside partners. The classic inefficiencies of big government were something that you could overcome (or at least reduce) with better human interface design.

O'Reilly's musings were accompanied by a conference, organized in 2009, called

Gov 2.0. One of the key organizers of that conference was Jennifer Pahlka. (She and O'Reilly have since married.) The two of them, and the conference itself, were perfectly matched with the optimistic, solutions-oriented strain of Democratic politics then in power. In the months leading up to the conference, Pahlka found herself on a conference call with Obama's White House CTO, Aneesh Chopra. "Obama really wants more than just a conference," Pahlka recalls Chopra telling her. "He wants us to *do something*." That encouragement, in part, led Pahlka to found Code for America, one of the defining organizations shaping the tech sector's evolving attitudes toward government.

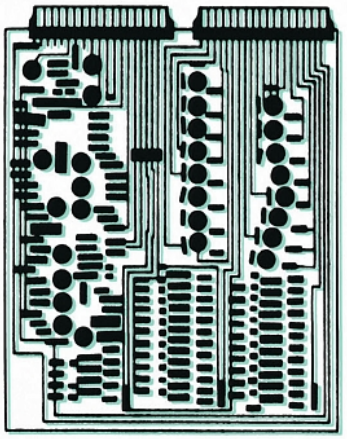
Today, Code for America has offices in downtown San Francisco, with motivational quotes about civic engagement painted on the walls. ("Government can work for the people, by the people, in the digital age.")

Code for America's ideology is fundamentally practical—"delivery driven," as Pahlka puts it. In 2014, for example, California passed a ballot measure called Prop 47, which gave nonviolent felons the opportunity to downgrade their convictions to a misdemeanor and thus gain access to public housing and a better chance of getting jobs. But the process to get a felony conviction reduced is "incredibly difficult," Pahlka says, and only a relatively small percentage of people who are eligible complete it. To smooth the way, Code for America is working on a "user-centered, mobile-friendly tool" called Clear My Record.

"You think about advocacy in this country," Pahlka says, "the win is getting the law passed. And then people are like, 'Great, we got the law passed!' But we didn't *implement* it." Pahlka still believes in the power of technology to help government perform its essential tasks. But that data-driven, technocratic vision of a better government now faces an existential threat. Not only is the Trump administration eliminating or reducing the types of programs tech liberals would support, it's also making some people within tech companies question the government work they do. Employees at Microsoft, disturbed by the separation of parents and children at the border, recently protested the company's work for Immigration and Customs Enforcement. And thousands of Google employees protested that company's work on an artificial intelligence project for the US military; Google recently announced it wouldn't pursue further contracts. Lurking behind these local skirmishes is a deeper feeling of dread: that the tech sector—and the social networks it spawned—contributed meaningfully to Donald Trump's victory.

IN MAY, I WENT TO VISIT KHANNA IN his Washington office in the Cannon House Office Building, which is decorated in the spare, patriotic style of most such spaces, an American flag standing next to framed photos of Khanna with his family and constituents. Khanna is a fan of Code for America and the Obama-era focus on government efficiency and civic participation; in a failed 2014 campaign for Congress, he was even fond of using the term "Government 2.0." But now he thinks that approach alone is inadequate. He's got a bigger agenda—one informed by the loss of middle-class jobs, the Sanders campaign, and Trump's success with blue-collar voters. Sure, tech is about innovation, but "the key component," he says, is "What is our role in helping people get good-paying jobs?" He points to Trump's campaign message to people in the coal and manufacturing industries: *You built America, and by God, you're going to stay at the top of America. Not these other people who came after you.* That message was potent and emotional. So, Khanna says, the response can't be "Well you know what? We're going to be building better user interfaces for the federal government."

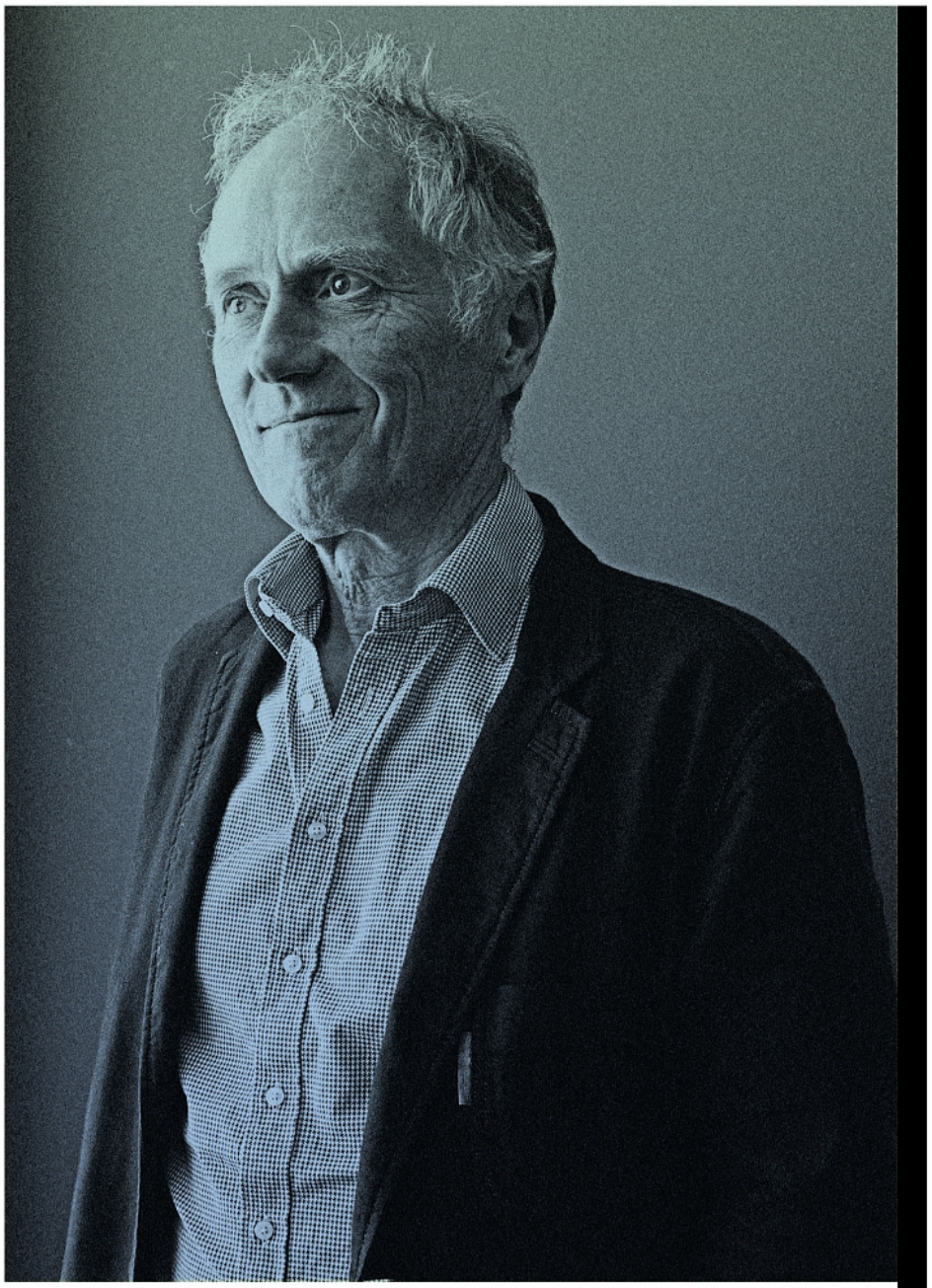
During Khanna's 2014 campaign, he ran as a pragmatic, tech-savvy progressive who could sling the vernacular of Silicon Valley against the longtime Democratic incumbent, Mike Honda. The political system, he told *The New Yorker* at the time, was static and needed "disruption" to "reintroduce the idea of risk-taking and meritocracy." After leaving the Obama administration, Khanna was an intellectual property lawyer at Wilson Sonsini Goodrich & Rosati, a venerable firm that had helped establish Silicon Valley as the corporate center of technology. He was, in other words, someone the tech community believed understood them in a way that Honda did not. Khanna racked up endorsements and donations from the



biggest names in tech, including even legendary Valley libertarian Peter Thiel, as well as Marc Andreessen, not known as a raging liberal. Still, Khanna lost.

He ran again in 2016 with a more staunchly progressive campaign focused on economic inequality, and his list of Valley supporters showed no sign of deserting him; even Thiel re-upped. This time, Khanna won. Typically when a heavily funded candidate runs a populist campaign, he will tack back to the center once in office. But since Khanna has entered Congress, he's become even more vocal about his progressive views. Now he talks both about user-centric design and an ambitious expansion of government benefits. During his first year in Congress, Khanna proposed a radical increase in the Earned Income Tax Credit, supplementing the wages of some low-income earners by $10,000 a year. Khanna conceives of the program as a response both to wage stagnation and the rise of the gig economy. It would cost $1.4 trillion over 10 years—and hasn't the slightest chance of passing in the current Congress. He's also drafting plans for a government-subsidized jobs guarantee for the long-term unemployed. It's modeled after an Obama-era stimulus program—so it, too, is going nowhere.

But even Khanna's EITC expansion plan is less radical than universal basic income,



Tim O'Reilly suggested that tech should help government, not scorn it.

a form of wealth redistribution that has become something of a fetish among some big names in the tech sector. Instead of tax cuts or wage supplements, UBI advocates propose providing a guaranteed income—a common sum cited is $12,000 a year—delivered to every American adult, regardless of income or employment. Wealthy tech executives did not come up with universal basic income—the concept's genealogy includes an interesting mix of Milton Friedman and Martin Luther King Jr.—but they have played a significant part in bringing UBI to mainstream notice. Supporters include Y Combinator's Sam Altman and Facebook cofounder Chris Hughes, who just published a book making the case for it. Greg Ferenstein suggests the enthusiasm for UBI can be explained by the idea that it is "a sort of venture investment in citizens." Brink Lindsey sees the tech elite enthusiasm in a different light: The idea of UBI offers insurance against the backlash to the economic upheavals driven by technology.

"You need a really well-constructed, comprehensive safety net," he says, "to keep people from freaking out over all the creative destruction that's being fomented by Silicon Valley."

KHANNA AND HIS TECH CONSTITUENTS may be aligned on the idea of addressing income inequality through government intervention, but in other ways, he is strikingly at odds with the prevailing views in his district, particularly when it comes to labor and regulation. With regard to labor, the big tech companies tend toward the paternalism of offering free goods and services on lavish campuses, as well as good pay. But their generosity has come with some caveats. In 2015, Adobe, Apple, Google, and Intel agreed to pay $415 million to settle a suit claiming they had violated antitrust laws by agreeing not to hire one another's engineers, which would have the effect of keeping salaries down. Nor do most tech companies directly employ the low-wage workers who would most benefit from unionization. Cleaning and delivery tend to be outsourced. In the Tesla manufacturing facility in Khanna's district, the

PHOTOGRAPH BY JESSICA INGRAM

company has reputedly blocked efforts by its employees to join the United Auto Workers union. CEO Elon Musk, via Twitter, has denied these accounts: "Nothing stopping Tesla team at our car plant from voting union. Could do so tomorrow if they wanted. But why pay union dues and give up stock options for nothing?" But the National Labor Relations Board has filed a complaint with multiple charges against the company.

Asked about those NLRB complaints, Khanna is quick to side with labor: "I believe that Tesla needs to do a better job in allowing for union organizing at its plant and also working with union workers." But he's more philosophical about the tech sector's general resistance to unions. Tech culture celebrates iconoclasm, individualism, he says. "But a union is very much about solidarity. About the community. About a social movement that you're part of."

The thornier issue for the tech sector is regulation. With growing calls for antitrust investigations of companies like Amazon, Facebook, and Google, the tech sector's general contempt for the regulatory state looks less like a principled stance and more like an attempt to avoid responsibility for the social and economic harm it can foster. Tech is known for pushing back against regulatory oversight, from Uber's aggressive battles against taxi regulations to disputes with European Union officials that culminated earlier this year when the new GDPR regulations took effect.

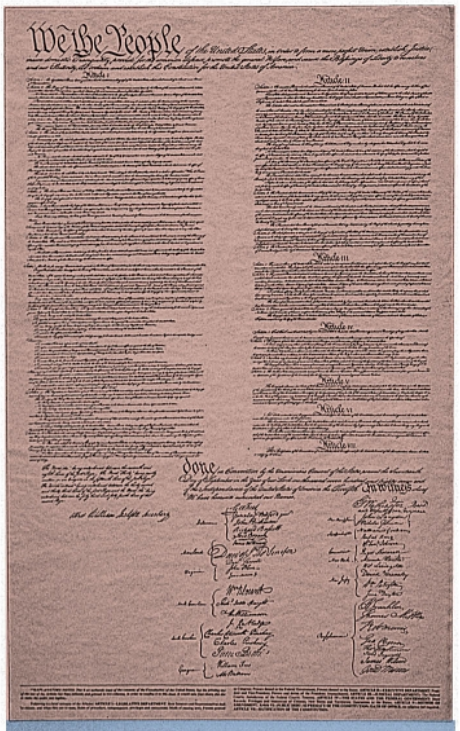
Ron Conway, a "superangel" investor who is one of Khanna's major supporters and a key figure in Bay Area Democratic politics, says tech companies are still trying to figure out a way to avoid the heavy hand of state oversight: "I think there's a very gradual migration to openness about regulation," he concedes. But according to Conway, Mark Zuckerberg's at times excruciating exchanges with tech-challenged politicians during his congressional testimony this spring may have reinforced the sector's belief that "self-regulation" would be preferable to "poorly considered regulations developed by people with limited understanding of technology."

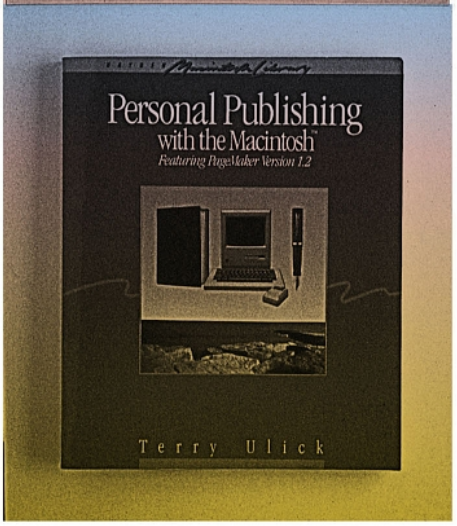
Of course most businesses would prefer to set their own voluntary industry standards. Khanna appears to have less faith than some of his Silicon Valley constituents in the capacity of Big Tech or any industry to follow through, and he's now bringing his understanding of technology to bear in a way that his Valley supporters might not have foreseen. After the scandals of recent months—Russian infiltration of Facebook's News Feed, political consulting firm Cambridge Analytica getting access to users' data without their permission, and the series of apologies and promises to do better next time—Khanna has begun work on a draft of what he calls an Internet Bill of Rights at the request of House minority leader Nancy Pelosi. The proposal would, Khanna says, ensure that consumers have some measure of data portability between online services, which would prevent the "lock-in" effects that can give rise to digital monopolies. Khanna also wants to broaden the scope of antitrust enforcement. He has spoken about the effect of monopoly power on wages and job loss, not just on whether concentration of economic power leads to higher prices for consumers.

When I ask Khanna about his support for government oversight of technology industries, he starts out strong: "Regulation is needed, especially around privacy and data protections," he says. "It's Congress' role to come up with legislation for these protections—it's not the job of thirtysomething

Jennifer Pahlka founded Code for America with a "delivery-driven" philosophy.

PHOTOGRAPH BY JESSICA INGRAM





entrepreneurs." But he's also careful not to get too specific and to offer up the expected paeans to the transformative power of technology. "Any discussion of antitrust needs to be nuanced and not simply 'big is bad,'" he says. "We need to make sure there is room for vibrant competition and new entrants in tech to promote innovation."

He suggests that Big Tech has leverage with Congress over coming regulation. Despite the recent drubbing Facebook and other companies have received in the news, the big tech companies still have a stellar reputation among the public. "These companies by and large are very popular now, according to polling," he says. "They are far more popular than Congress is."

FOR A LONG TIME, EVEN IF IT WAS difficult to locate Silicon Valley's views on the American political spectrum, it was fairly easy to characterize the tech industry's savvy with wielding political influence in Washington. Namely: Tech companies were neophytes. But that's changed. "I've seen the tech community go from being totally head-in-the-sand and oblivious to the political environment to being very politically aware and civically engaged," Conway says. "It's been a complete transformation—I think they got dragged into it by necessity, but it's a good thing that they're getting dragged into it."

Khanna is trying to drag them to the side of traditional progressives, and certainly there are many people within tech companies who are already there. But for some tech leaders, it may be too far. (The latest campaign finance records show that Andreessen and Thiel have not donated again, though Khanna's seat also seems safe.)

Lindsey suspects that some of the current appeal of left-wing politicians like Khanna can be attributed to the fact that the liberaltarian worldview doesn't have an obvious home in either party. It's a framework, he says, "that people in Silicon Valley are intuitively groping toward. But because there isn't an '-ism' out there on the shelf for them to grab ... it's understandable that they're getting pulled toward standard progressive politicians."

Consider this thought experiment: If we handed over the reins of government to the tech elite surveyed in the Stanford study, supplemented by Khanna's proposals, what kind of society would they conjure? The stagnant wages of the past 20 years would be supplemented by an expanded Earned Income Tax Credit, paid for by higher individual and corporate taxes. Health care would be universal and free. Student debt would be wiped out. And every adult in the country would get a seed investment of $12,000 a year, no strings attached. In return for those benefits, unions would continue their long slide into irrelevance. Workers would have to accept volatility, job loss, and replacement by technology. Startups would continue to drive unpredictable change in the economy, with limited regulation. In short, the collisions and turbulence of constant disruption would continue, but we'd have economic air bags.

Interestingly, the closest real-world equivalent to that vision is in the more entrepreneurial countries of Northern Europe: Denmark, Sweden, the Netherlands. As Lindsey puts it, those nations "combine very free markets and free trade with very robust social spending." Still, even if the progressive left and the tech elite appreciate the balance of those North Sea societies, there are other obstacles. As popular as tech companies are with the public, progressives are likely to see Big Tech as monopolistic and as evil as they considered Big Oil in its heyday, and almost as toxic as Big Tobacco, at least where our social health is concerned. Sanders-style activists, enraged by the injustice of income inequality, aren't likely to find a natural ally in a bunch of tech plutocrats.

On the other hand, the 2016 election made it clear that there are no givens in US politics right now. The "confusion" that reigned in the political arena in 1995 looks quaint next to the chaos of the Trump era. In such a turbulent environment, new alliances might be possible—and so might new fractures. You don't have to be a cheerleader for Facebook and Google to believe that the broader culture that gave birth to those giants might have some useful and original ideas about how society should be organized. To date, those ideas have been diffuse, lacking a real coalition or a standard-bearer. Khanna, whose professional lineage makes him the most logical candidate, might have some difficulty reconciling his views on labor and regulation with those of his key supporters. After years of building software platforms that came to dominate the planet, the tech sector has started to build its own distinct political platform. The question is whether there's a political party in America right now capable of running on it.

A Network of One's O

Everyone thought Oprah had finally failed. Then her cable channel started telling stories people wanted to hear.

By Jason Parham
Photographs by Ramona Rosales

Heart on her sleeve: Mara Brock Akil created *Love Is ___*, which premiered in June.

Tucked in the emerald backlands of Fayetteville, Georgia, inside a cavernous soundstage at Pinewood Atlanta Studios, Mara Brock Akil is in full field marshal mode. In 24 hours—after five months of taping between Los Angeles and Atlanta—she will wrap the first season of *Love Is ___*, her latest TV series. ¶ Right now Brock Akil is sweating, and not because filming has come down to the wire. It just so happens that the AC is broken. Scattered about the set, large electric fans expel ribbons of cool air that give little relief from the jungly May heat that has crept into the studio. "We should've worn our bathing suits today," Brock Akil jokes to the script supervisor before returning her attention to the two monitors in front of her, where the show's stars, Michele Weaver and Will Catlett, rehearse lines. There's still work to do.

With her signature nimbus of mahogany-and-gray curls tied into an overhead bun, Brock Akil, 48, knows how to persevere. In fact, she has made a career out of braving an industry that has systemically suppressed the voices of black female artists. Later, when we speak one on one, she will share with me the heart of her mission. "One of the things that I found, coming up, was that I didn't see us," she says of Hollywood's whitewashing. "I wanted to paint those pictures. As African Americans, we don't have pictures up on the wall of America that are true reflections of who we are. We certainly don't have enough of them." And so she painted, becoming something of a master of both comedy and drama with *Girlfriends*, *The Game,* and *Being Mary Jane*.

With *Love Is ___*, Brock Akil fastens another hue of black life to the wall of history. And this time, it's extremely personal. In warm, intimate strokes, the 10-episode series unpacks the relationship she forged with her now husband, Salim Akil (currently the showrunner for the CW's *Black Lightning*). The show arrives during a spectacularly pivotal moment for the Oprah Winfrey Network, where it debuted as the No. 2 telecast among African American viewers on June 19, with 1.2 million. (This viewership statistic, and the others cited in this article, were provided by OWN.)

Brock Akil is among a new class of creators—along with producer Will Packer, of the films *Girls Trip* and *Straight Outta Compton*, and Tarell Alvin McCraney, the Oscar-winning cowriter of *Moonlight*—steering OWN into a new era. In its infancy, from 2011 to 2013, the channel struggled with its programming, straying in a ratings wilderness as it relied on spiritual uplift and reality TV to attract viewers.

During that period, in April 2012, Winfrey appeared on *CBS This Morning* and all but acknowledged failure. "Had I known that it was this difficult," she said of OWN, "I might have done something else." But an uptick came with its first jump into original scripted dramas, in May 2013. The network had finally landed its white whale: solid viewership (its new drama averaged more than 2.2 million viewers that year) along with increased revenue. From there its path was clear. In the past handful of years, however, OWN has found sustained, if uncertain, success by zeroing in on stories relevant to its black viewer-

GROOMING BY CHRISTINA GUERRA/CELESTINE AGENCY

ship, and specifically black women. "If I can speak very frankly," Brock Akil says, "when Oprah first started the network, you could feel people wanting her to fail. I felt it. I was like, 'Fuck that.' " But here's the thing, she says: "Oprah doesn't have to do a network. It's not easy. Her willingness to put a stake in the ground and create space for artists to tell stories—from a woman who knows the impact of storytelling—is profound."

Profundity aside, revamping a cable channel's identity is no sure bet, even in an era when the mainstream TV economy has fattened. (In 2017, amid an industry-wide gold rush spurred by streaming services like Netflix, almost 500 scripted series aired across all of TV.) There are precedents, of course. AMC was able to reposition itself through a pair of Difficult Men antihero shows (*Mad Men*, *Breaking Bad*) and a punk zombie thriller (*The Walking Dead*). Similarly, FX scored runaway hits and a measure of acclaim by employing a kind of non-framework framework: Its executives embraced all manner of series—the freak show anthology (*American Horror Story*), the comically dark crime series (*Fargo*), the surrealist drama (*Atlanta*). All networks have an identity, and the lucky ones get to pivot. How is OWN navigating that transition? Better yet: Can it?

O

ON NEW YEAR'S DAY IN 2011, OWN WENT LIVE in some 80 million households across the country, replacing the channel Discovery Health. Though it was an upstart network, it had legacy cred—Winfrey's star power and an investment of $500 million from Discovery Communications. (WIRED's parent company Advance Publications owns a stake in Discovery Communications.) "We were attempting to do something that had never been done before," says Erik Logan, who became the president of OWN six months after its launch.

The goal was to "take the idea of a person and embody her belief structure and vision" in every aspect of the network, he says. "Everything that makes the brand of Oprah, we wanted to translate that into a cable channel across more than 8,000 hours of content." As Logan and his colleagues found out, that proved to be a more complicated endeavor—"very, very daunting," he says over the phone—than anticipated.

A proud Oklahoman, the 47-year-old Logan began working for Winfrey 10 years ago, when she hired him to be the executive vice president of her production company, Harpo Studios. He later joined OWN, where he soon became president. In our conversations, Logan did not shy away from discussing the network's early struggles; he often referred to them, in PR speak, as "big learnings."

The network's initial slate of programming wrestled with a crisis of identity: a forgettable Rosie O'Donnell talk show, a docuseries from Lisa Ling, and a batch of dull reality TV duds featuring Tatum O'Neal, Shania Twain, and the Judd family. There was also *Oprah's Lifeclass*—where the onetime Queen of Daytime offered guidance on, as she has often phrased it, how to "live your best life." (One thing that hobbled OWN's launch was that it couldn't actually put Winfrey on the network until her noncompete had expired with broadcasters; *Lifeclass* premiered nine months after the initial launch.)

Still, despite the lineup of stars, the shows didn't quite connect with an audience. "I was so misled in my thinking. I thought I was going to create a network that was *Super Soul Sunday* all day long," Winfrey said in an interview with *Vogue* last August. "I

JASON PARHAM (@nonlinearnotes) is a senior writer at WIRED.

In *Love Is ___*, Michele Weaver plays young Nuri to Will Catlett's young Yasir.

RICHARD A. DUCREE/WARNER BROS. ENTERTAINMENT INC./OWN

thought I was going to bring this spiritual consciousness-awakening channel!" But ratings were anemic, and relevancy—Could OWN be a conversation starter? Could the channel pump out a different kind of prestige TV?—eluded the grasp of executives.

When I ask Logan why he thinks relying so heavily on reality TV and self-empowerment didn't work, he plays it straight. "I don't know," he says. "I think we were more focused on trying to find what could work than trying to diagnose what didn't. There is a saying that Oprah has: 'What happens to you happens for you.' " Those obstacles, he says, helped the network better understand its intention (a favorite buzzword of Winfrey's) and who exactly it was speaking to: black women.

During March of its sophomore year, OWN aired one of its most-watched episodes to date—an *Oprah's Next Chapter* interview with Bobbi Kristina Brown. It was the first in-depth interview Brown had given since her mother, Whitney Houston, was found dead in a bathtub at the Beverly Hilton hotel the month prior. It pulled in just north of 3.5 million viewers. "What it said to me was: If we get the content right, they will find you," Logan says. From there, the network leaned in and found comparable success with Iyanla Vanzant's no-holds-barred brand of TV therapy on *Iyanla: Fix My Life*. As of June it was OWN's most-watched unscripted series.

For Logan, that codified the path—OWN had found an unexpected route. "That wasn't the intention of the network going into this, to talk to the African American viewer," he admits. After the successful launch of *Iyanla: Fix My Life* in 2012—the official two-episode premiere, about *Basketball Wives* star Evelyn Lozada, averaged 1.5 million viewers—Winfrey called Logan immediately. "She says to me, 'Listen, that's all I got. If this doesn't work, I don't know what works. If this is it, I know nothing about television.' It was one of those damn-the-torpedoes kind of moments. Obviously it was a huge success, but there are those moments you have with her."

It was the network's next jump that would turn out to be its most formative. In a partnership with Tyler Perry, OWN applied its most paramount lesson from *Iyanla: Fix My Life*: It would now target black women through a scripted series format. Perry quickly midwifed the soapy *The Haves and the Have Nots* and trite platitudinal working-class comedies like *Love Thy Neighbor*.

The network was getting traction. OWN ended the year "cash-flow positive," according to Discovery CEO David Zaslav. Eventually, Perry had four scripted shows under his aegis, proving he could guarantee a fiercely loyal audience. (Last year, in a surprise move, Perry decided to leave the network and signed a film-and-TV deal with Viacom for an undisclosed amount; new episodes of his shows will continue to air on OWN through 2020.)

Winfrey told *Vogue* that OWN is in its "best place ever," a spot that has allowed her to access a long-desired dream: "elevated premium scripted storytelling." (Winfrey declined to be interviewed for this article.) This is where *Queen Sugar*, the Ava DuVernay–created austral drama about the Bordelon family, and *Greenleaf*, a megachurch series set in Memphis, Tennessee (on which Winfrey has a small role), come into play. They became not just the standout shows on the network but two of the best dramas on TV—offering nuanced and knotty sketches of black Southern life. Both are among the top five original scripted series on ad-supported cable for women aged 25 to 54.

DuVernay tells me she was "honored to be asked to carve out a new kind of story for a network that wanted to turn a corner." When she began to envision the show, her hopes for it were simple: "To connect with an audience. To find an audience. And to have them stay. To engage. To care about the characters in the way that I have cared about television families in the past." DuVernay treasures the show's enduring influence among fans. "To have that now is quite dreamy," she says.

The arrival and sustained praise for *Queen Sugar* (based on the 2014 novel of the same name by Natalie Baszile) and *Greenleaf* signaled a sea change for the network: In addition to renewing its marquee scripted series, Winfrey signed high-profile first-look deals with DuVernay and Packer, announced a new show from Brock Akil (what became *Love Is___*), and green-lit a coming-of-age drama set in South Florida from McCraney. (Michael B. Jordan will serve as an executive producer.)

In DuVernay, Winfrey has found a successor. Oprah's superpower on daytime TV—the thing that made her so huge—was being at once unapologetically black and relatable for all, which DuVernay pulls off with equal aplomb.

While working on *Moonlight*, McCraney met with several networks—including Netflix, which wanted the series but was outbid by OWN. He wanted his first foray into TV to be on a network that genuinely fostered his vision. He didn't expect Winfrey to be in attendance when he met with OWN brass, but, to his surprise, there she was. "She came in and sat right in front of me, and from the start was wanting to open the story up and understand what it was about," he tells me when I reach him by phone in Los Angeles. "Almost immediately she began trying to find people and ways to make it work and happen. She was just instantly looking at, 'What's the frame here?' Like, 'If this is a portrait, what kind of frame do we use? How do we put the right support around it?' Whenever that happens—and it's rare that it does—it's a clear sign that

Start here, with an image.
Alter one. Then another.
And another. Color them with truth.
Frame by frame. And do not
stop. That is how revolution begins
in television.

someone has already invested their heart in it. They've already invested in it as not just something else to add to a list of things that they have, but it's something that they want to get behind and present to our people, to people who they feel need this, not necessarily just want it."

Winfrey, center, commissioned Brock Akil, left, to create a scripted drama about the early years of Brock Akil's romance with her now-husband (writer-director Salim Akil). Erik Logan, right, is president of OWN, Winfrey's cable channel.

IN A 2015 REPORT, *VARIETY* DECLARED the era of Peak TV was actually one of Peak Inequality. There was, the report showed, a glaring absence of gender and racial diversity in Hollywood, both in front of and behind the camera. "There is discrimination going on," Lesli Linka Glatter, an executive producer and director of Showtime's *Homeland,* told *Variety*. "I don't think anyone is sitting in a room twirling mustaches. I think it's more ingrained than that."

The Directors Guild of America analyzed more than 220 scripted television shows made in 2013–14, representing about 3,500 total episodes, and found that women directed only 14 percent of all episodes. Women of color directed just 2 percent of episodes. In 2015, the ACLU concluded that Hollywood had effectively become a boy's club—and a white one at that—which used "discriminatory recruiting and screening practices," ultimately "shutting women out." More recently, UCLA's 2018 Hollywood Diversity Report revealed that, among scripted TV creators on broadcast networks, minorities were underrepresented by more than five to one.

The stark reality spurred DuVernay to action. When *Queen Sugar* debuted in 2016, she staffed the season exclusively with female directors and has kept doing so throughout the show's three-season run. The transformations were not merely symbolic but institutional; OWN was knocking down barriers that had been in place for decades, saying *We will no longer tolerate this!* (The same year, top showrunner Ryan Murphy, who recently left FX for Netflix in a reported five-year, $300 million deal, launched the HALF Initiative, which similarly seeks to boost the number of directors who are women and people of color.)

"What was so enormously rewarding and validating, when we green-lit season two, we couldn't get some of those directors back

because they had been booked out," Logan says. "They'd gotten work. Generally you hear news like that and you get disappointed, but in this case you celebrated it. That is one of the great successes of *Queen Sugar*."

DuVernay makes no apologies for the policy: "*The Queen Sugar* directorial team is an all-woman team in the great tradition of the hundreds of all-male directorial teams for hundreds of shows, past and present."

At the same time, another shift was happening in Hollywood. Black audiences, it seemed, were hungry for real change and for more honest reflections from people like them. "We are used to seeing black bodies struggle in storytelling," Brock Akil says. "You see a movement of storytellers trying to say 'Hey, our lives are just as interesting in the mundane, or just as interesting in the wacky.'"

The year 2016 would prove to be a turning point for black storytellers and black viewers alike: There was a noticeable boom in shows that nurtured the soul and soil of black life. Along with *Queen Sugar* and *Greenleaf*, *Insecure* (HBO), *Atlanta* (FX), *Chewing Gum* (Netflix), *Star* (Fox), *The Get Down* (Netflix), and *Luke Cage* (Netflix) all debuted in the US within a six-month stretch. OWN had a major stake in this renaissance, as its two new scripted dramas did well among critics and, online, among newly minted fans, helping to chart a revised course for the channel's future. All Logan could wonder was, "How do we keep this going?"

For Vanzant, there was a deeper resonance in how OWN escaped the clichés of black life: celebrating the unseen. "OWN has taken that to a more constructive, positive level," she says. "When you look at Ralph Angel in *Queen Sugar*, that's a very different image. When you hear his voice, when you see his gentleness with his son, that's a very different image from that of the absent father. Even on *The Haves and the Have Nots*—when you look at Jeffrey as a gay man struggling, it gives you a different image of the issues gay men face in our world. We're giving the minds of the viewers a different interpretation than the one that's often put out in the world."

It sounds simple, but Vanzant is right. Start here, with an image. Alter one. Then another. And another. Color them with truth. Frame by frame. And do not stop. That is how revolution begins in television.

In OWN's *Greenleaf*, a megachurch drama set in Memphis, Lynn Whitfield plays Lady Mae Greenleaf and Keith David stars as Bishop Greenleaf.

I

IN HER 2004 COLLECTION OF ESSAYS, *THE BLACK INTERIOR*, POET AND scholar Elizabeth Alexander wrote of how "the black body has been misrepresented, absented, distorted, rendered invisible, exaggerated, made monstrous in the Western visual imagination." She asked, "How do we understand 'reality' when official narratives deny what our bodies know?"

TV, in the right hands, can be a way. And it has been, historically, in scattered bursts. A crop of black sitcoms from the late 1980s and throughout the 1990s cultivated such varied and radiant images. Across offerings like *A Different World* (NBC), *Roc* (Fox), *Living Single* (Fox), and *Moesha* (UPN), the luster and intricacy of black life began to emerge in the cultural imagination.

Networks like Black Entertainment Television (BET) and TV One, which took on a directive of "for us, by us" through its programming, expanded, and sometimes retracted, the social identities of its audience. These were networks that, first and foremost, derived and defined their identities through a racial lens. Programming, bad or good, was about one thing: the insistence of presence, black and unbowed.

In our current TV landscape, what was once a limiter is now a strategic advantage. The explosion of streaming platforms has reshaped our TV watching habits. This cultural thickening swept away the concept of the mass audience. (We've broken into "taste clusters," as Netflix likes to term it.) For a network like OWN, there is an immediate advantage in its singular focus on black life in all its gradations. This seems to be a much more reliable way to build a faithful viewership in 2018—one that is guaranteed, program by program, to produce a constant return on its investment.

And even as Winfrey expands her brand beyond OWN, the network has doubled down on scripted dramas: With calculation and care, it intends to stretch the genre's parameters, one black character at a time. (In mid-June, it was announced

TINA ROWDEN/OWN

that Winfrey had signed a multiyear talent deal with Apple, a rising player in the original content market, but will continue in her role as OWN CEO through 2025.)

Despite the lion's share of OWN's programming being promoted to a black audience, I never got the feeling that the network necessarily believes itself to be a black one. Unlike, say, BET, blackness is simply the prism and only occasionally the conversation starter for OWN. In a network promo released during *Queen Sugar*'s season three debut, various clips from its series flicker across the screen. Winfrey's voice narrates the one-minute spot: "When I was growing up, there were no images that looked like me on TV," she says. "To have not just people who look like you on television but whose stories are like your stories, it says 'You see me.' It is validating, as well as it is fortifying." The message is inescapable: Black stories are human stories.

The promo's reliance on the metaphor of *sight*—to see and be seen, an aspiration OWN now embraces in regard to its black viewership—reminded me of what the artist and photographer Carrie Mae Weems said about the power of images and the art of looking: "It's in that looking that you discover the multiplicity of a single thing, and the depth of a certain thing. And not only of a certain thing, but your relationship to that thing, and your relationship therefore with yourself is deepened."

In the hands of creators like Brock Akil, DuVernay, and McCraney, OWN is shattering old tropes and stereotypes about black identity. These are storytellers who understand the power of looking and what it means to be seen. They are architects molding new places for us to gaze upon and unravel, mirroring back images that challenge, affirm, glimmer.

As one of the largest production studios in town, Netflix wants to shape the future of TV: revolutionizing what we watch and how we consume it. The streaming service will likely release more new original content in 2019 than OWN, HBO, and Showtime combined. OWN is working on a smaller scale, but its motivations are no less grand: It seeks to rewire how we understand ourselves. The network wants nothing less than to show what is possible when you peer into the marrow of the human soul and reflect back the realities of America's most marginalized group of citizens in stories sculpted with love and a deep knowing.

Not coincidentally, this strategy is working on the business front. Scripted shows now occupy a third of OWN's prime-time hours, which has bolstered ratings. In May, the season three debut of *Queen Sugar* drew 2.1 million viewers, becoming the night's No. 1 cable telecast for women 25 to 54 and the No. 1 telecast across all of broadcast and cable for African American women.

Up next for OWN is season three of *Greenleaf*, which returns in late August across a two-night premiere, with guest stars that include Vanzant, Patti LaBelle, and Beau Bridges. Following that will be Packer's first series for the network, *Ready to Love*, a reality dating show set in Atlanta. According to the network, it focuses on "successful men and women of all shapes, sizes, and shades." In 2019 OWN's hot streak continues with a scripted series from Packer and with *David Makes Man*, McCraney's Miami-set drama.

When I ask McCraney what he feels the pressures are to telling full, lived-in stories, he laughs. "The pressures are always to tell authentic stories," he says. "It's interesting that a lot of people keep saying things like 'now more than ever.' I'm like, 'When was there ever a time when it was not necessary to tell the most authentic stories?' Whatever is at the center of your Rosetta Stone in terms of speaking your language, why wouldn't you want to put that forward? Why wouldn't you want to put that front and center? Why wouldn't that be your way in?"

He offers an analogy: "I keep thinking about my community, the 12 blocks of Liberty City that I grew up in, in Miami—how do I represent this place as authentically as I can? Over time you understand your place in your community, and I've always thought of my place as that weird person who lives on the periphery but who is also deeply engaged. As I'm told, the shaman didn't always live in the center of the community. Sometimes you get thrown out, or sometimes no one wants to listen to you. Sometimes the people in charge don't want to hear what it is you're seeing, or talking about—and that's OK. That doesn't mean you can't keep trying to engage the center of community."

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TWO DAYS BEFORE I LEAVE GEORGIA, I SPEAK WITH TD ANTOINE, THE on-set dresser for *Love Is___*. We're cornered in a giant, cream-colored banquet hall on the eighth floor of the Westin hotel in downtown Atlanta, where Brock Akil is shooting scenes for the season one finale. In the distance, extras hunch over in chairs and mill about the food station. Cocoa-skinned and gentle-voiced, Antoine has worked in the industry for more than 20 years, on films like *The Magnificent Seven* and *American Ultra*. He's grateful for the work, he tells me, but says there is something especially powerful about a show like *Love Is___* being on OWN.

"What do you mean?" I ask.

"We are so deep—we have so much to offer," he says. "And that's from the good and from the pain, from the growth that we can have. That's really what OWN stands for to me—the opportunity to tell our own stories. It fills the void that BET left. And for me, that's so important, because we're not one-dimensional people. Our experiences in life are different in America."

I press further. How so?

"Our experiences aren't the same, because of the history of America. And because of the history of America, we see it differently. We feel it differently," he says. "It's like when you try to light something—the shadows fall differently. That's our story in America, we have a different light, a different shadow, a different view."

Here, then, is OWN—propping up the light, tilting it just so, saying to its viewers: I see you.

An epic riddle.

An eccentric storyteller.

A missing person.

BY

DAVID KUSHNER

When a man vanishes in the wilderness on a hunt for hidden treasure, his family takes to the internet to find him.

082

EVERYBODY IS SEARCHING

for something. Paul Ashby's search began with an unexpected phone call on July 8, 2017. It was a Saturday night in Townsend, Tennessee, a small town just outside Great Smoky Mountains National Park. An affable Army vet with gray hair, a goatee, and wire-frame glasses, Paul worked as a concierge at a rustic event space called the Barn. He was dressed in his usual top hat and coattails that night, greeting guests who were attending a wedding.

Paul had lived in Townsend, off and on, since 1974. In 1990, he separated from his wife and moved with their 4-year-old son, Eric, into a mobile home, then a small hilltop house nearby. He turned the modest two-bedroom home into a hippie retreat, teaching himself to make artisan cheese and hanging a purple sign with his favorite quote by the front door ("There is no path to peace ... The path IS peace"). He'd often take his son trekking through the nearby hills and rafting down the Little River.

Paul had raised Eric mostly on his own, struggling to relate to his son's fascination with computer games and anime. Eric would carry his laptop a quarter mile down the hill to a telephone pole in an attempt to speed up his internet. "He'd be sitting down there at 1 o'clock in the morning," Paul recalls.

Eric was grown now—31 years old—but still had that headstrong streak. He had recently developed a singular obsession: an epic treasure hunt in the Rocky Mountains devised by an enigmatic art mogul named Forrest Fenn. In 2016, Eric had moved to Colorado Springs, Colorado, to devote more time to the hunt, which involves deciphering the clues in a cryptic poem, and on June 28, 2017, he told friends he had solved Fenn's puzzle and was going to retrieve the treasure. Paul didn't know much about the treasure hunt, but he was happy to hear his son was out hiking

and rafting as he had as a boy. That day, Eric posted on Facebook. "I hope today turns out to be the success I've hoped for," he wrote. "Wish me luck." Ten days later at the Barn, Paul received a call from an unknown number.

"Mr. Ashby?" said a young woman on the other end of the line.

"Yes?" Paul replied.

"Your son is dead. He fell out of a raft and drowned."

Paul figured his son was up to some kind of joke. "Tell Eric now is not the time to be playing pranks," Paul replied. "I'm in the middle of a wedding."

"No, Mr. Ashby, you don't understand," the woman said. "Eric is dead." Then she hung up.

Paul clutched his phone as the wedding party swirled around him in what felt like slow motion. He tried calling the number back but no one answered. When he dialed Eric's phone, the call went straight to voicemail. Who was the unknown caller? Where was his son? And why would Eric risk his life for an eccentric old man's game?

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FORREST FENN

doesn't own a watch, a cell phone, or a GPS. "I am not ready for the 21st century," he told me. When I visited him one sunny afternoon last April, he didn't seem to be much like a man for the 20th century either. He's 87, with wispy white hair and inquisitive eyes. His favored outfit is blue jeans, a belt with an ornate turquoise buckle, and Hush Puppies shoes. He lives on a couple acres of land in a sprawling home on the Santa Fe Trail. American Indian artifacts and Western curios line his walls: buffalo skulls, arrowheads, moccasins, and original paintings by the masters of the frontier. "Ralph Lauren came here and tried to buy that headdress," Fenn said, pointing to one in a feathered row hanging in his study. As with most of Fenn's stories, it's hard to know what to believe. As he admits in his self-published memoir, *The Thrill of the Chase*, "one of my natural instincts is to embellish just a little."

Fenn grew up in Temple, Texas, and still carries the soft twang of the Lone Star State. Though his father was the headmaster of his grade school, he sometimes played hooky, hunting for arrowheads in nearby creek beds. "When the sun was out, the smell of freedom was more than I could resist," he wrote in his memoir. He spent his summers working as a fishing guide in West Yellowstone, Montana, where his family had a cabin. After graduating from Temple High School in 1947 and marrying his high school sweetheart, Peggy Jean Proctor, he joined the Air Force. He flew hundreds of missions in Vietnam and was twice shot down, earning a Silver Star and Purple Heart.

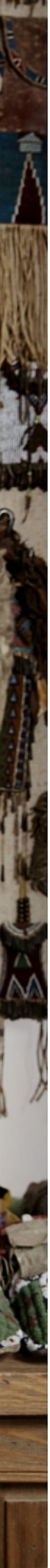
Fenn returned home on Christmas Eve, 1968, and retired from the Air Force two years later. He had been interested in American Indian artifacts since childhood, and he decided to make himself into an art and antiques dealer. In 1972, using the $12,000 annual stipend he received as retirement pay, Fenn moved his family to Santa Fe, New Mexico, and bought an adobe home, where he turned the ground floor into a gallery. Fenn made up for his lack of experience with a showman's streak. Noticing that competing galleries took out small black-and-white ads in local newspapers, he spent $3,000 on a full-page color notice in *Architectural Digest*.

His brash marketing methods worked, and wealthy collectors began visiting his gallery. "I'm a great schmoozer," he told me. Before long he was among the top-selling art dealers in town, he claims, earning up to $1 million a year. He transformed his modest gallery into a lavish, two-acre homestead

DAVID KUSHNER's *latest book,* Rise of the Dungeon Master, *is based on his profile of Dungeons & Dragons cocreator Gary Gygax in issue 16.03.*

DAYMON GARDNER

FOR ALL TO SEEK



Art dealer Forrest Fenn in his Santa Fe home. Eight years ago, Fenn claims, he hid a treasure chest filled with artifacts, gold, and jewels somewhere in the Rocky Mountains.

featuring three guest houses, a rapturous garden, and a pond containing two alligators named Elvis and Beowulf. Fenn says politicians and celebrities including former president Gerald Ford, Robert Redford, Cher, and Steve Martin made pilgrimages to Santa Fe to purchase his exotic goods and attend his legendary parties. Jackie Onassis once left behind a bottle of brandy, Fenn adds. He offered me a sip from what he claimed was the same 36-year-old bottle: "Shut your eyes and imagine you're drinking it with her."

In 1988, at the age of 58, Fenn was given a diagnosis of kidney cancer. Two years earlier, his 81-year-old father, William, was told he had pancreatic cancer, Fenn says. After 18 months, William killed himself by taking 50 sleeping pills, according to his son. "I respected him for having the courage to go out on his own terms," Fenn recalls. After being racked by chemotherapy and an unsuccessful surgery to remove the cancer, he says, he was given a 20 percent chance of surviving three years. As Fenn tells the tale, he decided to follow in his father's footsteps—but with his own swashbuckling twist. He would fill a treasure chest with gold and jewels, he thought, and carry it to a special place in the Rockies. Then he would swallow a bottle of sleeping pills and die beside his riches. But first, he would write a poem containing clues to the treasure's location. "Take the chest," read an early draft of his poem, "but leave my bones."

The "problem" with the plan, Fenn says, is that he recovered. Over the next several months, then years, he slowly grew stronger, and in 1993 he was declared cancer-free. After being homebound by his disease for years, Fenn was overcome with a renewed appreciation for nature and an urgent sense of purpose. "We need to get off the couch, out of the game room, and away from our electronic gadgets," he says. He now saw his hunt as a way to entice people into the wild.

Late at night, alone in his artifact-laden study, he tweaked and revised his poem. Finally, in 2010, long after he first hatched the idea, he was satisfied. He acquired a 10- by 10-inch bronze treasure chest and filled it with emeralds, rubies, diamonds, and gold coins he'd collected over the years at gun shows and auctions. He added two gold nuggets from Alaska, "as large as chicken eggs," he says, as well as an old Navajo bracelet with 22 prehistoric turquoise disc beads inlaid in silver.

One summer afternoon that year, Fenn drove into the Rockies—for how far and how long, he won't say—with the chest and the treasure in the trunk of his sedan. He made two trips to his destination. First, he loaded the empty, approximately 20-pound bronze box into a backpack and lugged it into the mountains, breathing heavily. He stashed it in a spot dear to his heart. Then he returned with the gold and jewels and filled the chest. "I was entering into strange territory in my mind," he recalls. He walked back to his car feeling giddy about what he'd done. "I said in a loud voice, 'Forrest Fenn, did you really do that?' " he says. "No one was around, and I started laughing."

In the fall of 2010, Fenn commenced the treasure hunt with the publication of *The Thrill of the Chase*, which includes his completed poem. The 24 lines contain nine clues to the chest's location, "in the mountains somewhere north of Santa Fe," he says.

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FENN
ORIGINALLY

printed just 1,000 copies of his memoir and stocked them at Collected Works, an indie bookstore in Santa Fe. In 2013, *Hemispheres* magazine ran a story on his treasure hunt. Soon after, the *Today* show aired a series on Fenn, and his slim, 150-page book became an overnight sensation. Thousands of buyers from as far as Italy and Ecuador flooded

THE DRIP, DRIP, DRIBBLING OF CLUES

SINCE PUBLISHING HIS TREASURE RIDDLE IN 2010, FORREST FENN HAS DOLED OUT ABOUT A DOZEN ADDITIONAL HINTS IN INTERVIEWS, BOOKS, AND TV APPEARANCES.

Collected Works' website. (First prints of *The Thrill of the Chase* can now fetch more than $750 on Amazon.) Despite Fenn's intent to lure people away from their devices, his hunt had all the ingredients—a cryptic puzzle, a tantalizing fortune, an intriguing mastermind—to go viral. News coverage followed, from national TV broadcasts and local newspapers throughout the Southwest. What started as one man's quirky swan song became a real-life *Ready Player One*.

Fenn achieved Wonka-like status among the self-described Searchers, the online community that cropped up around his legend. Lovers of riddles and outdoor exploration converged to form a dedicated network of blogs, message boards, websites, and Facebook pages devoted to the hunt. Toby Younis, a retired digital media executive who cohosts a Fenn fanatic YouTube show, *A Gypsy's Kiss*, says the internet helps them "crowdsolve" the puzzle. Searchers espouse theories in Fenn forums and detail their quests in YouTube testimonials. Dozens of Searchers meet in Santa Fe each June for Fennboree, an annual fanfest.

But despite the hive mind enthusiasm of the Searchers, others grapple with doubts about the truth of Fenn's tale. They imagine an 80-year-old man—or even a young, healthy person—carrying a bronze chest across his back. What kind of terrain—steep, wooded, rocky—could he traverse without tripping over tree roots and stones? Though a handful of Fenn's family and friends claim they saw him filling the chest, there's no way to prove what was inside, let alone what it could be worth. And, barring its discovery, there is no way to prove that he actually hid it. Given the more than 100,000 square miles of mountains where the box could be located, it seems unlikely that even the most intrepid Searchers will find it anytime soon, if ever. Still, over the past eight years, the possibility that the bounty does exist has been enough to spur treasure hunters into the red canyons of the high desert and wild rivers of the Rockies.

...IS HIDDEN, BUT NOT NECESSARILY BURIED.

A Puzzle in a Poem

Forrest Fenn announced his treasure hunt by publishing this poem, which contains nine clues to the chest's location. Thousands of Searchers have converged online to posit their theories on what the clues are and what they might mean. —ANDREA POWELL

As I have gone alone in there
And with my treasures bold, — 1
I can keep my secret where,
And hint of riches new and old.

Begin it where warm waters halt — 2
And take it in the canyon down,
Not far, but too far to walk. — 3
Put in below the home of Brown. — 4

From there it's no place for the meek,
The end is ever drawing nigh;
There'll be no paddle up your creek, — 5
Just heavy loads and water high.

If you've been wise and found the blaze, — 6
Look quickly down, your quest to cease,
But tarry scant with marvel gaze, — 7
Just take the chest and go in peace.

So why is it that I must go
And leave my trove for all to seek?
The answers I already know,
I've done it tired, and now I'm weak.

So hear me all and listen good, — 8
Your effort will be worth the cold.
If you are brave and in the wood — 9
I give you title to the gold.

1
"Where would Forrest go alone? To take a bath. And 'With my treasures bold' = his family jewels? So, river bathing." —JBL

2
"The obvious would be hot springs of some sort or another, although it could be something more akin to where tears fall, or where life ceases." —KAL

3
"The Sweetwater River was thus named by travelers coming to find gold in the West ... these travelers decided to cross its bends nearly 20 times. Surely this makes the river 'not far, but too far to walk.'" —MRI GROUT

4
"It is a garden located at the Buffalo Bill Museum called the Braun garden." —GEYDELKON

5
"I feel it's associated with ... [singer] Ernest Tubb's 'I'm Waiting for Ships That Never Come In,' which, to me, points to the area of Yellowstone Lake, the E.C. Waters on Stevenson Island, and Dot Island [in Wyoming]." —E.C. WATERS

6
"In 1878 the state of New Mexico did a full survey of the state. The state had a requirement that a tree blaze or stack of stones would be put every 2 miles on the border." —HOWARD

7
"I think it means get the hell out of there before a park ranger comes along." —TRI_WINE

8
"Right off the bat, this phrase makes you think of sound. So, something like Hell-roaring Creek would fit the bill." —FENN CLUES

9
"The treasure could be in a tree hollow. I think it's in a small mountain stream though, possibly behind a waterfall about 3 miles from a trailhead." —MARGINWALKER76

Fenn claims he receives more than 100 "treasure emails" from eager seekers every day. He told me that 350,000 people have looked for the treasure, an estimate he bases on his always-full inbox. For devout Fennheads, the appeal isn't just the money, it's "matching wits with Forrest," says 64-year-old Cynthia Meachum, who lives in Albuquerque, New Mexico. Since retiring from her job as a semiconductor engineer in 2015, she's devoted her life to looking for Fenn's treasure, first in a remote valley near Taos, New Mexico, and now near Yellowstone National Park. The hunt tends to attract people with technical backgrounds, Meachum says. "We're probably the most egotistical group of treasure hunters, because we all think, 'I use logic every day in my job. I use flowcharts. I use schematics. How hard can this be?'" she muses. "Well, none of us have found it."

Over the years, Fenn's poem has inspired Talmudic interpretation. One Searcher on the website Fenn Clues posits that, based on the first line, "We are almost surely looking for a location that satisfies 'alone.' So, a Solitary Geyser or a Lone Indian Peak would fit the bill." Other determinations are more arcane. A Searcher nicknamed the White Knight insists the "blaze" in the 13th line refers to a turtle-shaped tattoo on the chest of a character in Marvel's illustrated version of the 1826 novel *The Last of the Mohicans*. How that translates to the modern-day landscape is unclear.

Though Fenn occasionally stokes the frenzy with interviews, he regards online sleuthing as unnecessary. "There is no reason for anyone to use the internet or social media when going to search for the treasure," Fenn told me. "All they need is a map, a plan, good health, and a buddy to go along for safety reasons."

Perhaps inevitably, determined Searchers have disregarded his advice. In January 2016, Randy Bilyeu, a 54-year-old man from Broomfield, Colorado, disappeared with a raft while hunting for the treasure near Cochiti Lake in New Mexico. The news devastated the Searchers, who, for the first time, had lost one of their own. Bilyeu was embedded in the Fenn community: He was friendly with Dal Neitzel, who runs one of the most visited Fenn treasure websites, and he once met Fenn at a book signing in Santa Fe. Disturbed by the news, Fenn paid for a helicopter to carry a search party. Six months later, Bilyeu's remains were found on the banks of the river.

In June 2017, Jeff Murphy, an alleged Searcher from Batavia, Illinois, died of an apparent fall near the 7,000-foot Turkey Pen Peak in Yellowstone National Park. The same month, Paris Wallace, a pastor from Grand Junction, Colorado, died near the Rio Grande. The deaths have only garnered more publicity for the treasure hunt, spurring stories by *Nightline*, *The New York Times*, CBS News, and others.

The Searchers aren't the only ones at risk. Fenn and his family have found strangers digging in his backyard for the treasure, he says. One woman wandered up the driveway to pray. In April 2017, Fenn sought a restraining order against a 55-year-old Texan who showed up at his home taking photos.

Despite all this, Fenn insists it would be wrong to halt the hunt. "If I called off the search, what would I say to the 350,000 people who have had wonderful experiences hiking in the mountains with no ill effects except but a few mosquito bites?" he says. "An average of 12 people die each year at the Grand Canyon. There is a risk in nearly everything we do."

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AFTER
GRADUATING

from high school, Eric Ashby started cooking in restaurant kitchens around Townsend, nursing dreams of becoming a professional chef. With a wave of

...IS BELOW 10,200 FEET. ...IS NOT IN A MINE. ...IS NOT IN A GRAVEYARD.

dark hair, mischievous eyes, and a ready laugh, he made friends easily. He never had much money, according to Heather Britt, a friend of his, but he didn't seem to care about material things.

Then, in 2014, a motorcycle accident left Eric with a gangrenous leg. He told his dad that a doctor prescribed him oxycodone for the pain, and he got hooked. Though Eric fully recovered from the accident, "he couldn't get away from the pills," Paul recalls. Later, Eric took a swing at a plainclothes police officer who had pulled him over. He was convicted of assault and sentenced to seven years' probation.

Eric first heard about Fenn's treasure hunt in early 2016. He immediately geeked out over the riddle. As a child, Eric had immersed himself in fantasy books and sci-fi shows like *The X-Files*, and Fenn's puzzle had a similar allure. Tempted by the mystery and still struggling to overcome his oxy habit, in April 2016 Eric moved to Colorado Springs, where he had some friends. He knew he was violating his probation but thought that if he stayed in Townsend he'd end up back in jail anyway.

The change of scenery was just what he needed. He kicked the pills, his friends say, and found a job as a server at Edelweiss, a kitschy German restaurant. He lived in his car for a while to save money and started dating Jamie Longworth, a local medical marijuana grower.

By early 2017 Eric had become consumed by Fenn's treasure hunt, talking about it incessantly. He often stayed up late after waiting tables, smoking weed and compiling clues on his laptop. He tracked possible locations for the treasure on maps, homing in on Royal Gorge Park an hour away. Often he'd call Longworth to tell her how close he was to decoding Fenn's clues. Eric wasn't driven by money, she says. He enjoyed the intellectual puzzle of it all. "He was one of the smartest guys I ever met," Longworth recalls. "He would say his goal in life was to be fascinated by a blade of grass."

One day last spring, Eric met up with a group of friends and declared, "I know where Forrest Fenn's treasure is," says David Gambrell, who was there that day. According to Longworth, he believed the area where the "warm waters halt," as the poem describes, was the Arkansas River. He connected another clue, "put in below the house of Brown," to the home of a local physician, Dr. Brown, who had lived in the Gorge. And he deduced that the "blaze" Fenn cites referred to a fire that had happened nearby. When Eric described the precise location—nearly 60 miles southwest of Colorado Springs near Sunshine Falls, along the Arkansas River—Gambrell's gut tightened. He urged Eric to take precautions. "Make sure somebody's with you," Gambrell told him. Eric replied that he'd already made a few trips to that area, but bad weather and high waters had prevented him from reaching his destination. When he told Longworth where he was headed, she urged him to reconsider. "I was completely convinced it was unsafe," she recalls. "I didn't want him going." On June 28, Eric went anyway.

Ten days later, Paul received the anonymous call while he was greeting wedding guests. When he couldn't reach his son, he called the Fremont County sheriff's office in Colorado Springs. They told him there had been a reported drowning, but no body had been found, so they couldn't identify the victim. A few days later, he was contacted by detective Sterling Jenkins, a stocky, goateed officer who specialized in marijuana enforcement. Jenkins couldn't find a missing person report for Eric Ashby. It wasn't unheard of for people to vanish in the rivers and mountains around Colorado Springs, but it *was* unusual for the disappearance not to be reported. Paul later told Jenkins that he believed his son had been out searching for Fenn's treasure, but the detective had never heard of the hunt. "I didn't know if it was an accident," Jenkins says. "I didn't know if it was foul play. It could be a hoax." The detective vowed to find out what had happened.

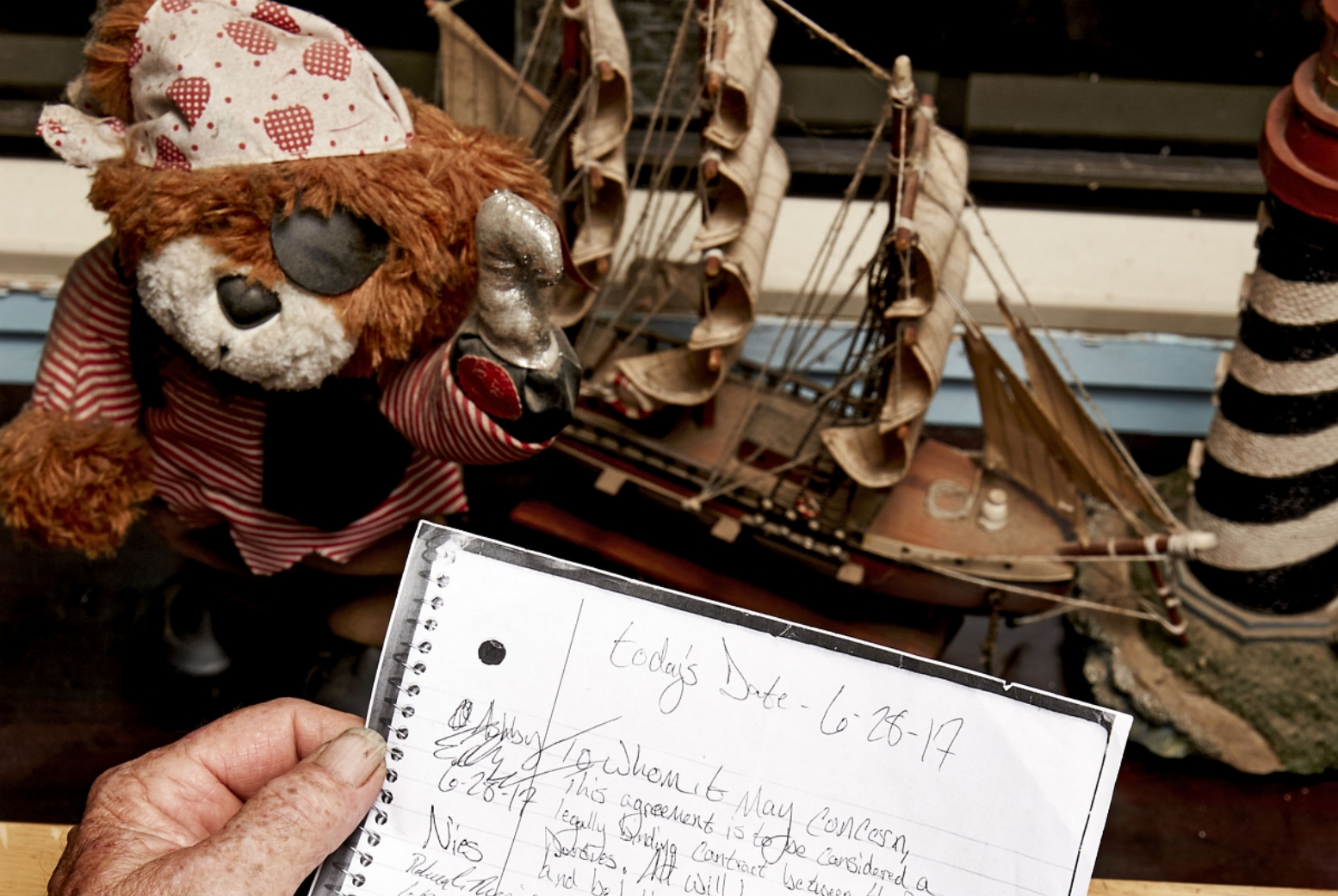
Eric Ashby

Paul Ashby in the former bedroom of his son, Eric, at his home in Townsend, Tennessee.

ERIC ASHBY: COURTESY OF PAUL ASHBY

...IS HIGHER THAN 5,000 FEET ABOVE SEA LEVEL.

...DOES NOT REQUIRE THE SEARCHER TO BREAK ANYTHING TO FIND IT.



Today's Date - 6-28-17

To Whom it May Concern,
This agreement is to be considered a legally binding contract between the four mentioned parties. All will have a copy of contents, and be held accountable by that remaining group members. The mentioned "group" members is to consist of; Eric S. Ashby, James T. Booker, Rebecca A. Nies, and Anthony J. Mahone

All agree upon a split down the board as follows.
Eric Ashby - 51% of everything +/- Bonuses
With the remaining 3 Members splitting the remaining 49%, Except for Eric Ashby who is electing to give his percentage away for a single piece of treasure to be shared at discovery, but Must be agreed upon by all remaining group members. Upon which his 1/3 of the 49% will be split among the rest of group evenly. The 51% group is also responsible for the 25% Bonus for whoever finds the chest first. Eric Ashby will be the executor of the selling and distribution (documented) of assets regarding Buried Quests.

Ashby
6-28-17

Nies
6/28/17

Booker
6/28/17

Mahone
6/28/17

Paul Ashby holds a copy of the contract drawn up by his son on the day he disappeared. The document stipulates that Eric will split the treasure among those hunting with him, should it be found.

WORD OF ERIC'S

disappearance soon spread across Searcher blogs and message boards. But unlike Bilyeu, who had attended Fenn book events and was immersed in the Searcher community, Eric was unknown to other treasure hunters. Though he had spent hours poring over their theories and tips, Eric wasn't an active participant in Searcher forums. He rarely shared his hunches online, and he often went treasure hunting alone. As details about Eric's checkered past emerged, some in the close-knit Searcher network viewed Eric's disappearance with skepticism. One faction pushed to distance the Fenn community from Eric's case, arguing that his rumored drug use would cast the hunt in a negative light. Others questioned whether Eric was looking for Fenn's treasure at all when he went missing. When I asked Neitzel about Eric's case, he bristled and refused to answer. "Let's move on," he said gruffly. Eric, they seemed to say, wasn't one of them.

Without the aid of the Searchers, Eric's friends and extended family dissected Fenn forums and Facebook pages for possible clues that might lead to him. "We called ourselves the Investigators," recalls Britt, his friend from Townsend.

Lisa Albritton, Eric's half-sister on his mother's side, led the family's efforts from her home in Largo, Florida. Though she and Eric had grown up in different states, she in Florida and he in Tennessee, the siblings were in touch often.

In truth, it didn't take long to find out what had happened to Eric. Shortly after Paul received his mysterious phone call, Albritton went to Eric's Facebook page and posted a query on the growing thread of comments from Eric's concerned friends: "Does anybody know the names of the people my brother was with?" she wrote. "Please feel free to message me, add me, I don't care I just need answers."

A friend of Eric's in Colorado Springs quickly replied with a profile picture of a smiling, twentysomething woman with shoulder-length blond hair, dark eyebrows, and a fashionably shredded pink shirt, along with a name: Becca Nies. "Can somebody tell me what role she plays in this?" Albritton replied. Longworth offered an answer: "She was with him, as well as her boyfriend Jimi Booker, when he 'drowned,' " she posted. She then provided a screenshot of a Facebook message that Nies, who had worked with Eric at Edelweiss, had sent her on Saturday, July 8, just hours after Paul got his mystery call, and 10 days after Eric had gone missing.

Nies said that she was with Eric and three of her friends that day. "On wednesday june 28th," Nies wrote, "we went on that treasure hunt. Eric drowned in the river unfortunately. Im sorry to tell you like this, you deserve to know.... Very sorry."

The note from Nies should have put an end to the sleuthing, but it only seemed to spark new clues and paths to investigate. "How does she know he drowned if he hasn't been found?" one of Eric's friends replied on the Facebook page. "Sounds like some bs to me," offered another. The police weren't giving any information, and Eric's body had not been found. In that vacuum, and in the heated detective atmosphere of the treasure hunt, rumors flew: It was a fight that landed Eric in the water, a scheme to steal the treasure from Eric and leave him behind.

The most vexing question remained: If four people had watched a man disappear underwater, why did they wait 10 days to tell anyone? That delay stoked its own conspiracies. "Something strange is going on it seems like with no one wanting to talk to anyone!!" one Investigator posted. "They really aren't gonna like it when a bunch of people from Tennessee show up on their door step!!!"

On the Arkansas River near Sunshine Falls—where Eric was last seen—the rapids are unpredictable.

...IS SOMEPLACE WET.

"Exactly!" Britt replied, "And that's what it's gonna take!"

That July, Albritton launched a GoFundMe page hoping to raise money to drive to Colorado. Eric's family continued to check in with Jenkins, but as far as Albritton could tell, the sheriff's office was making little progress. She pleaded for help in finding her brother. To her surprise, she received $3,500 from a single donor: Forrest Fenn. Word about Eric's disappearance had spread across Searcher blogs and message boards, eventually reaching the Wizard of Oz himself in Santa Fe.

Albritton and a cousin made the drive from Florida to Colorado in four days. They arrived in Colorado Springs and checked in to a hotel. Days later, they went to Nies' apartment. Eric's red Mercury Cougar was still out front, where he left it the day he disappeared. Albritton cued up Facebook Live as she approached the car, video streaming—just in case anything happened. "We're going in the car, and I'm just going to try to grab everything I can," she narrated, her voice tense. In the back seat, Albritton found her brother's backpack. Heart pounding, she grabbed it and sprinted back to their car.

Back at their hotel, Albritton dumped out the contents of Eric's bag: some moldy sandwiches, two cell phones, and a notebook. When she flipped the book open, she found a handwritten contract between Eric, Nies, and her friends agreeing to share whatever treasure they might find—51 percent for Eric and 49 percent to be split among the others. Albritton held the contract with a shaky hand. "Eric Ashby will be the executor of the selling and distribution (documented) of assets regarding said Quest," the contract read. There was nothing treacherous in the document itself, but stoked by the hours she'd spent unspooling conspiracy theories among Investigators online, her mind reeled: Had there been a plot to kill her brother and steal the treasure? She reported what she had found to the Colorado Springs detectives.

Alarmed, Paul flew to Colorado Springs to search for answers. He met with Jenkins, who took him out to the spot on the Arkansas River where Eric had last been seen. Jenkins told him that two photographers had been taking pictures of whitewater rafters that day and called 911 after witnessing a possible drowning. But there was no way of knowing if the person had been Eric—the victim was unidentified and no body had been found. The people who were with him had been questioned, but Jenkins had not yet reached any conclusions. Desperate and sleepless, Paul called his brother, an Army specialist, for advice. If no one else could find his son, then Paul wanted to search the rapids himself.

"Can we go get him out of the river?" he asked.

"Paul, don't even bother," his brother said, "If the river is ready, the river will give him back to you."

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ON JULY 28,

a body was discovered by a Colorado Parks and Wildlife officer several miles down the Arkansas River. A Fremont County coroner later identified the victim as Eric Ashby.

After several weeks of investigating—questioning Nies and her friends Jimi Booker and Anthony Mahone, as well as the two photographers who had witnessed the incident—Jenkins and his team pieced together what had happened that day in June. Eric had driven to Nies' apartment, where the group drew up a handwritten contract. They set off toward the river in an old green Jaguar sedan, stopping along the way to buy a cheap, two-person raft. They wound along mountain roads to a parking lot near Royal Gorge Park, where a suspension bridge hovers nearly 1,000 feet above the Arkansas River.

Eric led the group a few hundred yards through piñon pines to the edge of Sunshine Falls, a churning, boulder-strewn section of the river. As they watched rafts of tourists careen by, Booker told Jenkins, the current roared higher and faster than they had expected. Sunshine Falls is known for violent Class IV-V rapids, powerful enough to hurl rafters into the choppy water. Eric, who said he had been to the same spot on previous excursions, assured the others that it was still passable. "When he saw the river, he seemed OK with it," Booker told me on Facebook Messenger, but "he said he had almost died on this hunt before." (Nies and Mahone did not respond to requests to be interviewed for this story.)

Eric told them he believed the treasure was on the other side of the river. He planned to float across in the raft, retrieve the box, and bring it back. Despite his insistence that he had plenty of experience whitewater rafting, Eric had taken no helmet or life vest. He tied one end of a rope around his body and gave the other end to his companions on the river's shore. "We weren't prepared," Booker told me later. "We had seen whole teams of rafters ride by with maybe six or seven people on large rafts, and they were still having a hard time riding the current with a professional guiding them."

Midway across the river, Eric's flimsy raft started pitching uncontrollably in the froth, and he fell into the rapids. (Nies and Booker told the sheriff's office he jumped out of the raft.) The rope slipped free from his waist as he was swept away in the fast-moving current. He attempted to make it to the other side but plunged underwater. When he hit the next set of rapids, known as the Sledgehammer, he went under again. This time he emerged facedown. He was carried away by the current.

From their post a short way downstream, the photographers looked on in horror as the body floated by. They frantically called 911 for help. Booker claimed that he and his friends searched along the shore of the river for half an hour, but the water was too violent. They returned to their car and drove away without waiting for the police to arrive. One of the photographers later told the police that he was troubled by the witnesses' behavior, given the circumstances. "He told me it appeared as though they were not concerned with the unknown male's well-being and had not bothered to attempt to assist the individual when he was in the river," deputy Jeffery Moore wrote in his report.

Booker told me they took off because they knew the photographers had already called for help and felt there was nothing they could do. "I felt so powerless that it kills me inside," he wrote me, "because my natural instinct would have been to jump in that water, but I know I wouldn't have made it."

Nies told Jenkins that she knew Eric had left Tennessee while on probation and didn't report his disappearance to the authorities because she didn't want to get him in trouble with the law. She said she wasn't sure whether Eric was dead or alive. But by not giving the sheriff's office Eric's name, no one—including his family and friends—had known what had happened to him. "They're absolutely negligent," Jenkins says. "A life was lost. People watched it happen."

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ON A RAINY WEEKEND

in March, I attended an event for Eric at the Barn in Townsend, where Paul still works as a concierge. Paul had his son's body cremated and brought back to the hills of Tennessee. Pictures of Eric hiking and cooking lined a table alongside a box bearing his cremains. Local country singers performed ballads on the small stage.

Now Eric's family wants to make sure such negligence doesn't happen again. They're working with Colorado and Tennessee legislators to pass Eric's Law, a "duty to report" mandate that requires any witness who sees someone's life in danger to notify 911. Paul hopes the law ensures that "no one walks away," he says.

He originally blamed Fenn for Eric's death. "I wanted to see him hung out to dry," he says. He's since made his peace. Jenkins places responsibility on the Searchers. "As an adult," he says, "if you make a decision to look for this treasure, you need to be prepared."

When I talked to Fenn, he had distanced himself from Eric's death. "I told myself that he was on drugs and had nothing to do with the treasure," Fenn says. He continues to encourage the treasure hunt. In a recent interview with a blog called *Mysterious Writings*, Fenn wrote that his "gut feeling is that someone will find it this summer." In fact, he reveals, a Searcher recently came within 200 feet of it. "Someone told me exactly where they were," he tells me, "and I knew they were close." He declines to say more, wary of tipping off the Searcher. His prediction, of course, will likely only spur more Searchers to return to the wild.

With each new death, the stakes of the search grow higher. Fenn continues to urge his followers to avoid putting themselves in life-threatening situations. (After all, he cautions, he was already 80 years old when he hid the treasure; there's no need to assume feats of endurance.) This summer, thousands will take to the Rockies' tributaries and trails, racing to glimpse the glint of a bronze chest in the wilderness. If it is discovered, many Searchers admit, it won't just be the lost fortune they'll miss—it will be the lure of adventure, the misfit community, the promise of the unknown around every bend. W

...IS MORE THAN 300 MILES WEST OF TOLEDO, OHIO.

COLOPHON

OPRAH MOMENTS THAT HELPED GET THIS ISSUE OUT:

The sad despair of bread-substitute bread; watching *The Crown*; riding a horse across Oprah's nature reserve in Hana on Maui; *Less* by Andrew Sean Greer; "The only way you could get me to do that," in reference to bikini waxing, "is with a morphine drip with three shots of tequila"; seeing her perfectly typecast as a super deity in *A Wrinkle in Time*; Angry Oprah takes down James Frey; going into the Ugly Cry; telling myself I can buy uncomfortable "15-minute shoes" because Oprah does it; #Oprah2020; just out here looking for my Stedman; that time I went to Chicago but was too young to attend a live show so all I got was a picture in front of the Harpo sign; YOU'RE A CREATIVE DIRECTOR! YOU'RE A CREATIVE DIRECTOR! YOU'RE ALL CREATIVE DIRECTORS!!!; communing with yeast and the elements at Wild Flour Bakery in Freestone, California; delightful 24-hour getaway with my personal Gayle King; seeking My Authentic Self while ascending Vernal Falls; I LOVE BREAD; a Queen is never afraid to fail; speaking your truth is the most powerful tool we all have.

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THE LAST LINE OF A MYSTERY SOLVED ONLINE:

NOBODY SUSPECTED AI IN THE INSTAPOT.

BY @MOLCO, VIA INSTAGRAM

HONORABLE MENTIONS: THE PERFECT CRIME, FOOLISHLY LIVE-STREAMED. (@MIKEWATERS2201, VIA TWITTER) **// THE DEVIL IS IN THE METADATA.** (@ROADMAPWARRIOR, VIA INSTAGRAM) **// HER CAR. THERE. ON SATELLITE VIEW.** (STEVE WIGHT, VIA FACEBOOK) **// INCOGNITO MODE NEVER REALLY PROTECTED HIM.** (@TIFFANYXJIANG, VIA TWITTER) **// THAT "LIKE" UNDOUBTEDLY PROVED ALL LIKELIHOOD.** (NIKOLAOS KATSAROS, VIA FACEBOOK) **// ELON CHUCKLED KNOWINGLY TO HIMSELF. "BLOCKCHAIN."** (@AVERYREGEN, VIA INSTAGRAM)

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